Is the relationship between intention and physical activity moderated by socioeconomic status? A systematic review.

by

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I declare that this report is my own original work and that contributions of others have been duly acknowledged

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Abstract

Evidence indicates that individual intention, as conceptualised by Theory of Planned Behaviour (TPB) is the most proximal predictor of physical activity; yet, the intention-physical activity relationship might vary by difference in socioeconomic status (SES). The present study systematically reviewed the existing literature in an attempt to explore the moderation effect of SES on the relationship between intention and physical activity. Searching identified 90 studies from 82 articles. SES indicator was comprised three dimensions – education, occupation and income, and SES indices were measured using the standardised point system Random effect meta-regression was employed, and the result found that intention was a significant predicator of physical activity (28% variance explained). Moderation analysis revealed that overall SES indicator was not a significant moderator for intention-physical activity relation. Analysis on individual indicators showed that education and occupation were significant moderators, whereas income was not. Different facets of SES have more merits than the overall SES, which provided more specific information on intention-physical consistency.

Introduction

Regular physical activity is beneficial for the promotion of health and prevention of chronic diseases (Lakoski, Willis, Barlow, & et al., 2015; Powell, Paluch, & Blair, 2011). For instance, a review shows that engaging in moderate physical activity leads to risk reductions for breast cancer (75%), cardiovascular and heart diseases (49%), diabetes (35%), and colorectal cancer (22%) (Kruk, 2007). In addition, different intensity levels of physical activity might have various benefits for improving health. Moderate-intensity physical activity can increase (by 3 to 6 times) the body's metabolism to resting level, which has been shown to improve cardiorespiratory fitness and reduce the risk of heart diseases (World Health Organization [WHO], 2010). Participating vigorous-intensity physical activity regularly raises the metabolism to at least 6 times its resting level, which has been shown to have a strong relationship to lower mortality rates (Lee & Paffenbarger, 2000). Recommendations suggest that adults should participate in physical activity for at least 150 minutes at a moderate intensity per week, or 75 minutes of vigorous intensity (WHO, 2010). However, national survey data indicates that 60% of adult Australians spent less than 30 minutes per day doing physical activity, and almost 30% of adults reported more than 5 hours of sedentary leisure activity each day (Australian Bureau of Statistics [ABS], 2013), which is much less than recommended. The survey also shows that only 43% of adults met the sufficiently active threshold against the National Physical Activity Guidelines (ABS, 2013); 36% of adult Australians were classed as insufficiently active, while 20% were classed as inactive (ABS, 2013). Similar results can be seen in South Asian (Ranasinghe, Ranasinghe, Jayawardena, & Misra, 2013), the United States of America (Centers for

Disease Control of Prevention, 2013) and Europe (World Health Organization [WHO], 2013).

Physical inactivity has been identified as the fourth leading risk factor globally for mortality (6% of deaths globally) (WHO, 2010). For instance, low levels of physical activity significantly contributes to obesity, which in turn can lead to various health problems such as diabetes and heart diseases (Lopez, Mathers, Ezzati, Jamison, & Murray, 2006). Current global physical activity trends strongly suggest a need for effective promotions to increase physical activity. These promotions are not limited in preventing or limiting the progression of disease, but include improving physical fitness, muscular strength and quality of life (Pedersen & Saltin, 2006). In order to design an effective intervention, it is important to better understand factors that predict physical activity. This thesis will look at the role of intentions, the most important modifiable psychosocial predictor of physical activity as outlined in the Theory of Planned Behaviour (McEachan, Conner, Taylor, & Lawton, 2011), and examine whether the impact of this predictor on physical activity is moderated by socioeconomic status.

Socioeconomic Status and Physical Activity

The role of socioeconomic status (SES) on physical activity has been well established, with much research demonstrating lower prevalence of sufficient physical activity in people with lower socioeconomic status. For example, one study examined the social inequality in adolescents and found that adolescents with low family wealth were associated with lower level of physical activity (De Cocker et al., 2012). Another study investigated socioeconomic differences in recreational walking among older adults and found that the lower education group and lower income

group were more likely to report no recreational walking (Kamphuis et al., 2009). A study collected data from a large adult population (n = 4785; response rate 64.4%) using large-scale postal survey. They examined the socioeconomic inequalities in sports participation from neighbourhood, household, and individual factors and found that doing no sport was reported most frequently in lower socioeconomic groups (Kamphuis et al., 2008). With the increasing number of studies investigating the impact of SES on the realisation of physical activity, understanding the definition of SES is vital as it facilitates the interpretation of various effects of SES.

Socioeconomic Status is usually conceptualised as the social standing or class of an individual or group in the social hierarchy (American Psychological Association, 2007). Differences in SES indicate the difference in access to and distribution of resources which affect individuals' ability to engage in different health (or unhealthy) behaviours, such as physical activity and diet (Gidlow, Johnston, Crone, Ellis, & James, 2006; Sandvik, Gjestad, Samdal, Brug, & Klepp, 2009). In addition, one's SES can influence an individual's health cognitions, including attitudes towards behaviours, self-efficacy, executive functioning and intention (Ball, 2009; Raver, Blair, & Willoughby, 2013). While SES reflects a relatively holistic picture of individuals or groups, it is often measured by factors such as education, occupational classification and income (American Psychological Association, 2007).

Education

Receiving better education can enhance an individuals' ability to search for, understand and interpret health-related information (Goldman, Turra, Rosero-Bixby, Weir, & Crimmins, 2011). In other words, individuals with higher education are

more capable of seeking supports, forming concrete plans and maintaining stable intentions for health-related behaviour. With this, the ability fostered might facilitate individuals to get greater access to resources regarding physical activity (Goldman et al., 2011). Furthermore, education was found to have strong association with occupational status, with higher educational achievement leading to higher-status job (Cheng & Furnham, 2012). This advantage might contribute to greater economic resources, making well-educated, higher SES individuals more financially flexible, making for greater range of choices regarding access to physical activity.

Occupation

Individuals with full-time employment are more physically active than those who are employed part-time or unemployed (Van Domelen, et al., 2011). In particular, systematic reviews demonstrated consistent results that occupational status was positively associated with physical activity, with people employed in higher-status occupations having higher levels of physical activity compared to their lower SES counterparts (Trost, Owen, Bauman, Sallis, & Brown, 2002; Kirk & Rhodes, 2011). It is suggested that high-status jobs lead to more financial resource and flexible time arrangement facilitating individuals to get access to leisure facilities, which in turn have better opportunities to execute physical activity (McGuire, Kenney, & Brashler, 2010). For example, joining membership in sport club or buying more sport equipment.

Income

A systematic review showed that poorer people not only have less access to leisure facilities, but that they may live in an environment that does not support physical activity (Gordon-Larsen, Nelson, Page, & Popkin, 2006). Low-income

people often confront difficult social and environmental barriers to physical activity. Some of these barriers include less access to parks and recreational facilities, air pollution, and lack of meaningful transportation choice which might hinder individuals from doing outdoor activity and being forced to travel a long distance to reach leisure facilities (Romero, 2005) In this regard, the more barriers the low-income groups confront, the lesser frequency of these groups performing physical activity (King, 2001). In addition, low-income groups have been found to be lack free time due to job natures requiring more actual labour force, which lead to inflexible time arrangement (Gordon-Larsen et al., 2006). Inflexible time arrangements thus make it difficult for low-income groups to spend optimal time participating in physical activity (McGuire, Kenney, & Brashler, 2010).

Previous systematic reviews have examined the relationship between SES and engagement in physical activity (Gidlow et al., 2006; Humpel et al., 2002). The results indicated a positive relationship between SES and physical activity, that is, people with higher SES engaged in higher levels of physical activity. This implies that inequality of resources could lead to differences in the realisation of intentions for physical activity.

Research supports this idea - For instance, a prospective study found that the education moderated the intention-behaviour relationship for self-reported physical activity, and that relationship was stronger in the better-educated group (Godin et al., 2011). Godin et al., (2011) argued that well-educated individuals have more stable intentions which improves the intention-behaviour translation. In another longitudinal study, occupational status moderated the intention-activity relation, such that the relationship was closer in groups with higher occupational prestige. (Conner,

Jackson, & Woolridge, 2013). Moreover, Conner et al. (2013) argued that deprivation of economic and social resources might affect the realisation of behaviours, such that the availability of money, environmental constraint and psychological resources may strengthen the relationship between intentions and healthy action.

In this regard, different SES groups perform behaviours differently. For example, lower SES groups typically live in poor environments, which have been shown to have worse traffic and transport conditions. Research has shown that poor living environments affect individuals ability to become physically inactive, and this is attributed to a fear of traffic, poor road safety or high-speed traffic (Grayling, 2002; Ogilvie, Egan, Hamilton, & Petticrew, 2004; Wen, Orr, Bindon, & Rissel, 2005). Contrary to the low SES group, higher SES group live in better and safer built enviornments which allows greater access to resources and leads to active transportation. For instance, diversified leisure facilities provide many environmental cues for physical activity, and these cues can trigger the initiation of action without conscious intent (Stalsberg & Pedersen, 2010). For example, building better cycling paths might trigger one become active on biking. Thus, it is anticipated that individuals with low SES, as compared to their high counterpart, are more resource-deprived and might encounter more barriers in acting upon intentions for physical activity (Conner et al., 2013)

Nevertheless, studies investigating physical activity and SES have been inconsistent. For example, the moderation effect of SES found in Conner et al.'s studies (2013) was not consistent with Vasiljevic, Griffin, Sutton and Marteau's (2015) findings, in which no evidence of SES moderating the intention-physical

activity relationship was found. This variation might be due to inconsistent operationalisations of SES, and thus, the present study was designed to address this difference by examining both overall SES indicator and different facets of SES.

Theory of Planned Behaviour and Physical Activity

Evidence has shown that different facets of SES such as education, occupation and income may influence the realization of physical activity, and it is assumed that the effects of SES on behaviour are moderated by psychosocial predictors in the model of The Theory of Planned Behaviour (TPB). TPB is the most widely used and well researched psychosocial theory that attempts to explain how and why one participates in physical activity (Armitage & Conner, 2001; McEachan, et al., 2011). According to the TPB, the initiation of a behaviour is always determined by a person's intention; it is assumed that intention is the most proximal factor that affects a behaviour. Intentions indicate an individual's motivation towards behaviour - if an individual has a strong intention towards the behaviour, then they will be more likely to perform the intended behaviour (Ajzen, 1991) (as shown in Figure 1).

Intention is further conceptualised to be predicted by three related psychological constructs (Ajzen, 1991): *Attitudes* refers to the affective and cognitive appraisal of behavioural outcomes. For instance, the health benefit of being physically active might motivate individual's intentions as evaluating the outcome to be profitable. *Subjective norm* refers to the perceived social pressure for the intended behaviour. For example, if the living environments and neighbourhood are supportive for physical activity, individual would be more likely to join in the environment and become physically active. *Perceived behavioural control* relates to

the belief that a person can control the intended behaviour and comprises of internal and external control factors. For example, physical activities such as jogging and running are perceived to be under greater volitional control. This, and the fact that they are more temporally accessible (not dependent on opening hours of a gym for instance), may promote a stronger sense of individual autonomy, leading the individual to act on their intentions of physical activity. As a general rule, a behaviour is more likely to occur if intentions are strong, and this in turn is determined by expectations about profitable outcomes (attitude), social approval (subjective norm) and strong control belief (perceived behavioural control) (Ajzen, 1991).

A recent meta-analytic review showed intention was the most important TPB-based predictor of various risk behaviours ($\beta = .35$, mean $\rho = .38$, $k = 29$), and was particularly important for physical activity ($\beta = .42$, mean $\rho = .48$, $k = 103$) (McEachan, et al., 2011). This review supports the application of TPB model in understanding the relationship between intention and physical activity, but did not examine the role of socioeconomic status in this relationship. Intentions explained 8.57% of variance in physical activity (McEachan et al., 2011), however, there was a substantial variation with approximately 91% of the variance remaining unexplained, which leaves a room for other factors to be investigated. Hence, the current review will build upon this previous work, while McEachan et al.'s study (2011) reviewed the literature up until 2010, the present review extends beyond 2010 and focuses primarily on physical activity.

Application of Theory of Planned Behaviour: Moderated by Socioeconomic Status

The TPB model is versatile in understanding behaviours, but it is restricted by focusing on variables on the level of the individual only. Some recent studies provide evidence that, beyond these individual predictors, district-level SES can affect the degree to which individuals translate their intentions into behaviour (Gordon-Larsen et al., 2006; Schüz, et al., 2012). Moreover, research examining the moderation effect of SES on the relationship between health cognitions and health behaviours found that for individuals with lower SES, the relationship between intentions and behaviour was weaker. This suggests more difficulties for those individuals in translating their intentions into behaviours (Conner et al., 2013). These findings are in line with the environmental factors proposed by WHO (2013), in which different facets of SES are considered to have direct or indirect effects on individuals, affecting their intention for physical activity. For instance, increasing evidence demonstrated a moderation effect of SES on health cognitions and health behaviours, with a number of them focused on the intention-behaviour relation. It was proposed that the intention-behaviour "gap" can be moderated by SES (Conner et al., 2013). Thus, exploring the moderation effect of SES could provide more information on the influence and potential mechanisms of different SES facets on the intention-behaviour relationship. Accordingly, the present study adopted the TPB model and tested whether measures of different aspects of SES moderated the impact of intentions on physical activity (as shown in Figure 1).

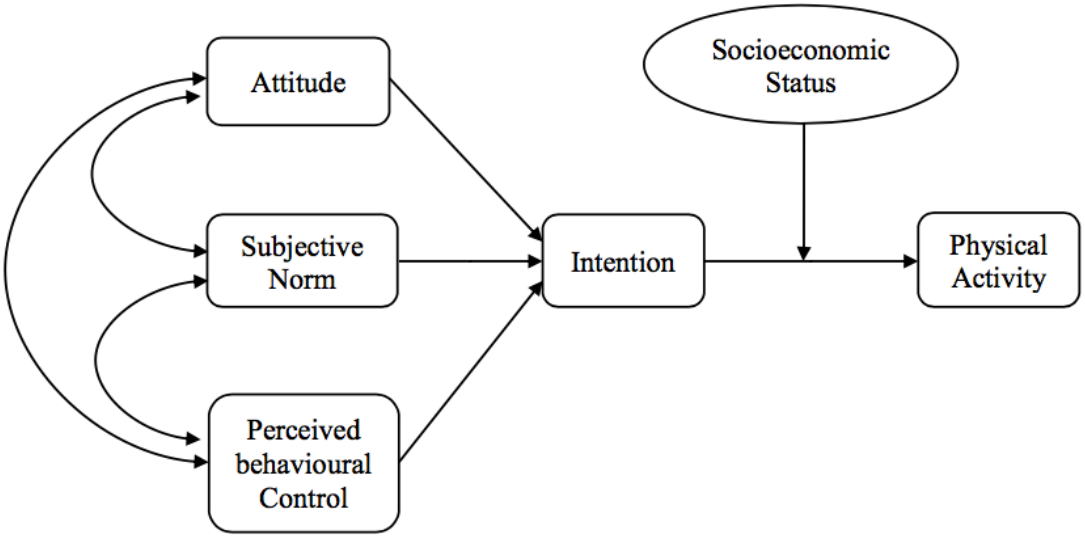


Figure 1. The Theory of Planned Behaviour on physical activity moderated by socioeconomic status.

Rationale and Objectives

While previous systematic reviews suggests that there is substantial heterogeneity in the relationship between intention and physical activity, the present study aims to address this variance by exploring the possible moderating effects of SES on this relationship. In addition, there is a large number of studies that have examined the relationship between intentions and physical activity while at the same time reporting the SES of the study sample. This allows an exploration of the moderation effect of SES through a larger quanitity analysis. Using a systematic review approach, the present study explored the existing literature in terms of the relation between TPB model and physical activity while at the same time classifying the socioeconomic status of the samples in the studies reviewed applying the facets of income, education, and occupational status as well as an overall indicator of SES. We then examined the moderation effect of SES on the intention to participate in physical activity. It further investigated whether SES related differences in individual

behavioural self-regulation, according to the TPB variables, might explain some of the SES differences in physical activity.

This study aims to:

1) Explore whether the predictive value of intention for physical activity observed in previous systematic reviews can be replicated.
2) Estimate the degree of heterogeneity in the relation between intentions and physical activity.
3) Test the extent to which intention-physical activity relationship is moderated by different operationalisations of SES.

Method

To answer these research questions, a systematic meta-analytic review was conducted. Results are reported in accordance with the Preferred Reporting Items for Systematic Review Analysis Statement (PRISMA) (Mohe, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009) (Appendix A)

Information Sources and Literature Search

The present study focused on the prediction of physical activity using the Theory of Planned Behaviour (Ajzen, 1991). It expands upon a previous systematic review on the relation between Theory of Planned Behaviour variables and health behaviours (McEachan et al., 2011). For studies prior to 2010, the reference list from a study by McEachan et al. (2011) was searched for studies examining physical activity. This search identified 88 studies out of 206 articles reported in this previous systematic review.

Search Strategy

For consistency, the same search terms used by McEachan et al. (2011) were applied to search for literature published since 2010. Additional search terms specified the inclusion of physical activity.

Two electronic databases – *Scopus* and *Web of Science* were searched. In accordance with McEachan et al. (2011), the search strings were (1) attitud* and norm* and control and intention*; (2) theory of planned behavi*; (3) planned behavi*" and Ajzen; (4) physical activity or activity or exercis* or walk* or run* or jog* or golf or tennis or swim* or soccer or sport or athlet*; and (5) physical activity" OR activity OR exercis* OR walk* OR run* OR jog* OR golf OR tennis OR swim* OR soccer OR sport OR athlet*.

1,063 articles were identified in the first attempt from *Scopus*. Of these, 21 articles were excluded due to insufficient and inconsistent information; hence, a total of 1041 articles were identified in the first search. The search on *Web of Science*, revealed 489 articles. After integrating articles from both databases, with the removal of duplicates, 1277 potential articles were identified.

By combing the articles found from the three sources, a total number of 1365 potential studies were identified in the search process.

Eligibility Criteria

Studies were eligible for inclusion in the present review if they met the following inclusion criteria: (a) reporting correlations between the constructs (even if not all variables) of the Theory of Planned Behaviour (attitudes, subjective norms, perceived behavioural control, intention); (b) outcome measures were frequency measures of any kind of physical activity. Intervention studies were eligible for inclusion if baseline correlations (before the intervention was applied) were reported. Lastly, (c) studies had to provide information about the socioeconomic status of their sample in at least one of these categories - education income, or employment status

Studies were excluded if they met the following criteria: (a) participants were students or adolescents whose age were on average under 18 years old; (b) study did not examine physical activity of participants, but of physical activity endorsers (e.g. health professionals, teachers, parents); (c) studies with secondary analysis, such as studies with data already provided in other included studies, or review studies.

Literature Selection

Applying these inclusion and exclusion criteria, the title and abstract of each article were screened. Full texts were retrieved of those articles meeting the inclusion

criteria in the abstracts or titles, or which could not be excluded based on the abstracts and titles.

In the first step, 1277 articles were excluded from the review after screening titles and abstracts because of not meeting the inclusion criteria. In the second step, full text of the remaining 200 studies were retrieved, and a further 168 of articles were excluded based on the exclusion criteria. Original authors were contacted through emails and asked for missing information, in particular correlation matrices and clarification around SES measures. A total of 32 articles were identified that provided all information required.

To examine inter-rater reliability between the two students working on this project, a random selection of articles were double-coded by both students. Acceptable to high inter-rater agreements were found (Cohen's $\kappa = .73$ for articles found in *Scopus* and $\kappa = 1$ for articles identified via *Web of Science*).

A total of 88 articles were identified in the previous review (McEachan et. al, 2011) that matched the inclusion criteria. Of those, 38 articles were excluded on the basis of the exclusion criteria. A total of 50 articles were identified, with high inter-rater agreement (Cohen's $\kappa = .89$) between the research students for inclusion and exclusion.

As a result, after adding up the studies from three sources, there were 82 articles identified and were eligible for analysis. A flow chart for the study selection process is displayed in Figure 2.

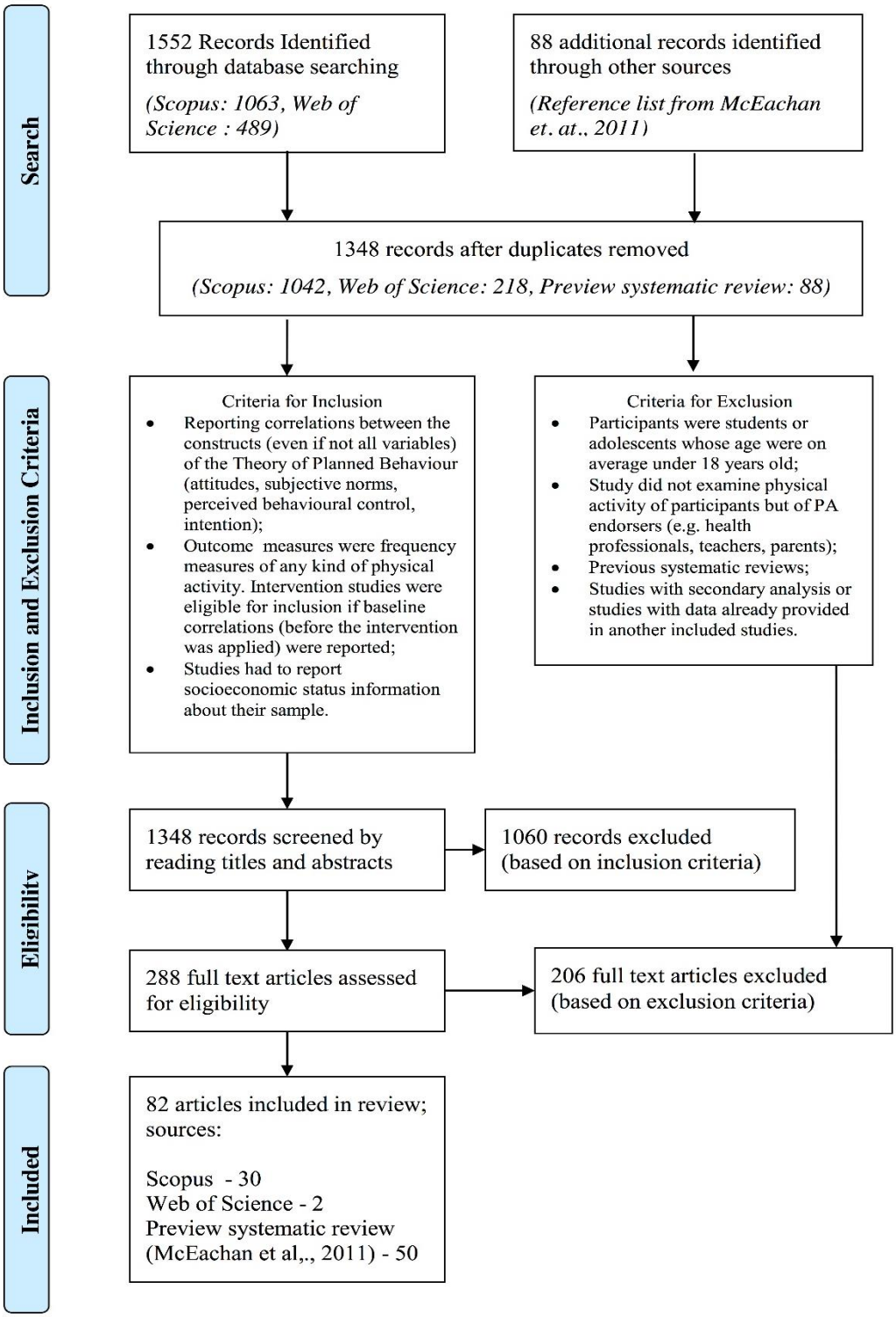


Figure 2. Flow diagram of the literature search and study coding.

Data Collection and Coding

The coding sheet used by McEachan et al. (2011) was adapted for this study to additionally include SES indicators (education, income, or occupational status). When studies provided two (or more) correlations for one construct (e.g., two different correlations between intentions and physical activity for two different intention items), correlations were averaged using Fisher's r-to-z transformation. Reliability indicators (Cronbach's alpha) of multiple scales were adjusted using the Spearman-Brown formula (Eisinga, Te Grotenhuis & Pelzer, 2012).

Coding of Correlation and SES information

To be comparable across studies, the present review coded each SES indicator using a point system developed by Lampert, Kroll, Müters and Stolzenberg (2013). This point system was developed based on three status dimensions: (a) formal education and vocational training, (b) occupational status and (c) weighted household net income. Lampert et al. (2013) transferred these three dimensions to metric scales and weighted the categories based on their predictive value for income categories. In each dimension, a minimum of one and a maximum of seven points are awarded, with in-between values also being awarded in regard to the external criteria. The categories and corresponding point values of the index are shown in Figure 3.

Using this point system, each study was scored based on the SES information reported. Points were awarded based on the majority group in the sample. For instance, if a study reported that 51% of the sample obtained university education, then educational status was scored as 4.6. The income categories in the Lampert et al. (2013) point system were transformed into percentiles, and archival data on national

income distributions was used to determine the study sample relative income percentile based on the publication year of the study i.e. for a study published in 2008 that reported income information of a Canadian sample, the approximate percentile of this average income was determined by comparing the study income information to the Canadian household income distribution in 2008).

Two types of indicators were available for each study: First, information on the different SES facets was coded as above. Second, an *overall* SES indicator was computed based on the maximum point score if more than two SES categories were reported. Each indicator was further split into a high and low group using median split in order to deal with floor and ceiling effects of the unequal distribution of the SES indicators.

All correlation coefficients between intention and physical activity were extracted and coded into the coding spreadsheet, with the coefficients ranged between the lowest of r = -.21 (Savvidou, Lazuras, & Tsorbatzoudis, 2012) and the highest of r = .83 (Conner & Abraham, 2001).

Meta-Analytic Strategy

The effect size reported in the studies were zero-order correlations. In metat-analysis, it is assumed that the sampling distribution of the observed outcomes is (approximately) normal. However, using the raw correlation coefficient to estimate the sampling distribution may be subject to bias as the distribution estimated would become skewed. Thus, Fisher's z-transformation was used to convert the correlation coefficients into standardised units in order to stabilise the variance (Fisher, 1921). The pooled correlation coefficient with its corresponding confidence limits were calculated according to the Fisher's z-metric.

In realistic situation, it is very likely that the true effect size (in the underlying population) differs across studies due to heterogeneity. As heterogeneity between correlation coefficients is a precondition for this study, a random-effects meta-analysis was performed in order to allow for the true effect size to vary across studies and to estimate the distribution of effect sizes (Borenstein, Hedge, Higins, & Rothstein, 2010).

To examine heterogeneity between studies, Q and I^2 statistics were calculated. The Q statistic assesses the ratio of the observed variation to the within-study error, and a significant *p*-value indicates heterogeneity between the individual studies (Huedo-Medina, Sánchez-Meca, Marín-Martínez, & Botella, 2006). The I^2 statistic indicates the percentage of variability in the correlations that are due to true differences among studies; it assesses not only if there is any between-study heterogeneity, but also provides an estimate of the degree to which there is heterogeneity (Higgins, Thompson, Deeks, & Altman, 2003). Higgin et al. (2003) suggested tentative benchmarks for I^2: values of 25%, 50% and 75% might be considered as low, moderate and high respectively. While the Q statistic aims to identify the heterogeneity across studies, the I^2 statistic aims to determine the proportion of the real heterogeneity.

The meta-analytic strategy involved three steps, all of which were conducted in R using the 'metafor' package (Viechtbauer, 2010). In the first step, a common metric between the studies was obtained by using Fisher's z-transformation. The second step was to estimate overall effects and heterogeneity in the effect sizes using random-effects meta-analysis modelling. The final step was to test whether some of

the heterogeneity was predictable from moderator variables using random-effects meta-regression.

In a meta-analysis, it is always possible that the results will be biased due to unpublished, missing or otherwise unidentified studies that potentially report non-significant or even contrary findings. This phenomenon was described as the ‘file drawer problem’ (Rosenthal, 1979), which suggests publication bias because of unpublished studies. One of the implications of this problem is that there is a publication bias towards result that are statistically significant or that have larger effect sizes. In this regard, funnel plots were displayed in order to assess the risk of bias.

Results

Study Characteristics

Eighty-two articles with k = 90 studies provided relevant information and thus were included in the meta-analysis. Of these studies, 85 studies provided self-reports of physical activity, while 4 studies measured physical activity by using attendance records and 1 studies applied objective physiological measures (dayPAR - ratio of daytime to resting energy expenditure, estimated by heart rate monitoring). Most studies used self-report measure of physical activity, and most of these (n = 44) used the Godin-Shepard Leisure Time Physical Activity Questionnaire (LTPA; Godin, Jobin, & Bouillon, 1986), followed by the International Physical Activity Questionnaire (IPAQ; Craig, et al., 2003) (6 studies). Sample sizes in the studies ranged between 35 (Taut & Baban, 2012) and 1280 (Chaney, Bernard, & Wilson, 2014). The studies were from 11 countries, with United States (31%), Canada (31.%) and United Kingdom (24%) accounting for the vast majority of them. With regards to socioeconomic status indicators, 80 studies reported information on the educational attainment of the sample (89%), followed by income (16 studies, 18%), and occupation (5 studies, 6%). Only 14 studies provided information on more than one SES indicator. For more key studies characteristics refer to Appendix B.

Relationship of Intention to Physical Activity

Figure 4 shows that nearly all correlations between intention and physical activity were positive: higher levels of intention were associated with a higher frequency of physical activity, and lower levels of intentions were associated with lower levels of physical activity. Only two studies reported negative correlations (2 of 87; Jekauc et al., 2015; Savvidou, Lazuras, & Tsorbatzoudis, 2012).

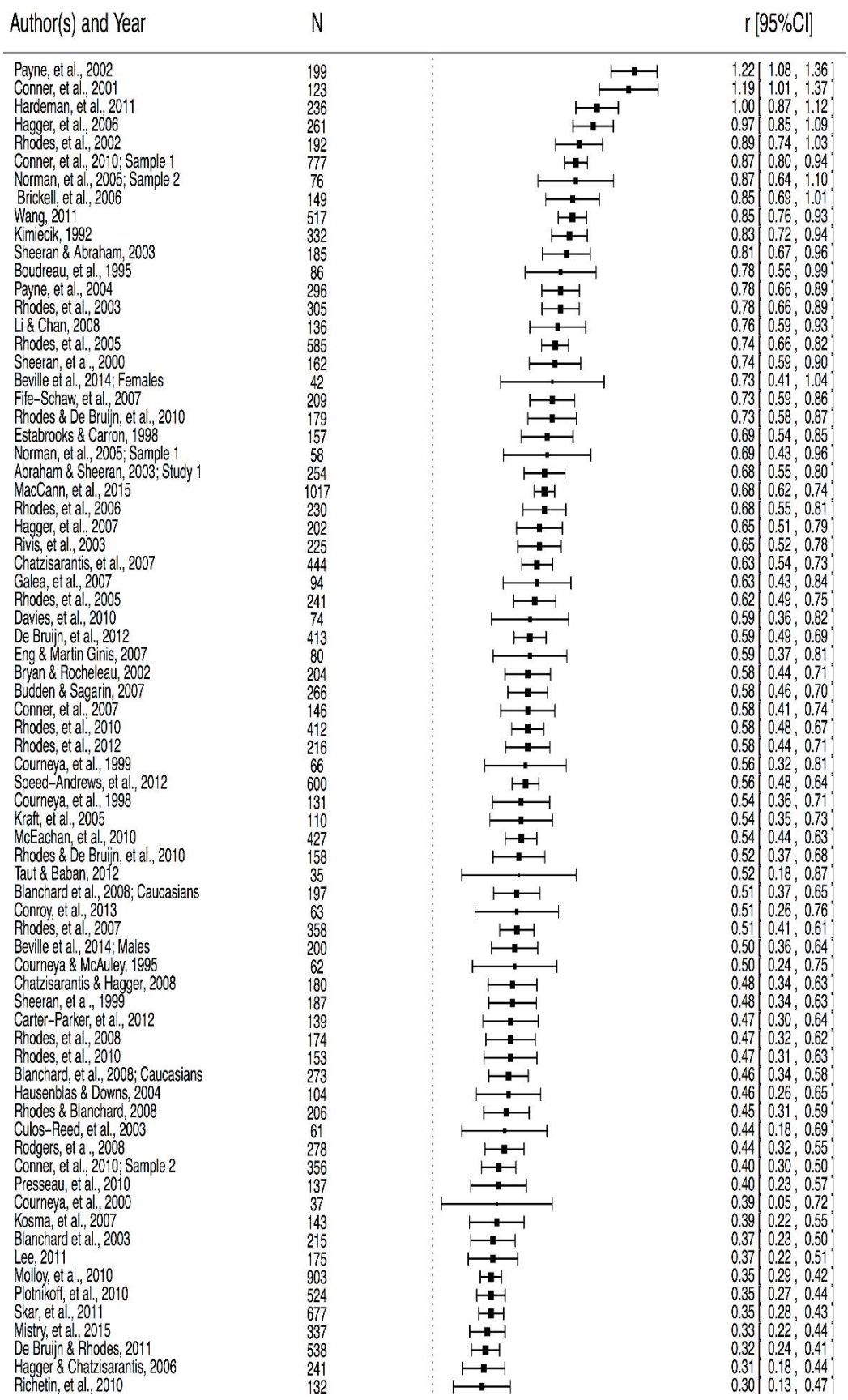
Fisher's z-transformed correlation between intention and physical activity was .53, 95% CI = [.48, .58], which indicates that intention explained 28% of the variance in physical activity, 95% CI = [23.04%, 34.64%]; thus 72% of the variance in physical activity remained unaccounted for. Regarding heterogeneity between the studies, the I^2 statistic, which specifies the percentage of the between-study variability in effect sizes that is due to heterogeneity rather than random error, indicates that was a high degree of heterogeneity in the effect sizes, I^2 = 93.62%. In addition, Q statistic, which reflects the total dispersion of studies, indicates that there was a significant dispersion between studies, Q(86) = 1361.52, p < .001. This suggests that there was substantial variation in the effect sizes (Table 1) between studies, and that moderator analyses were warranted.

Table 1

Meta-Analysis of the Relationship between Intention and Physical Activity

	Physical Activity					
	k	*N*	r_z (SE)	(95% CI)	Q	I^2
Intention	87	22975	.53*** (0.03)	(.48, .58)	1361.52***	93.62%

Note. r_z – Fisher's z-transformed correlation coefficient; *p < .05, **p < .01, ***p < .001b


Author(s) and Year
N
r [95%CI]
Payne, et al., 2002 199 1.22 [1.08 , 1.36]
Conner, et al., 2001 123 1.19 [1.01 , 1.37]
Hardeman, et al., 2011 236 1.00 [0.87 , 1.12]
Hagger, et al., 2006 261 0.97 [0.85 , 1.09]
Rhodes, et al., 2002 192 0.89 [0.74 , 1.03]
Conner, et al., 2010; Sample 1 777 0.87 [0.80 , 0.94]
Norman, et al., 2005; Sample 2 76 0.87 [0.64 , 1.10]
Brickell, et al., 2006 149 0.85 [0.69 , 1.01]
Wang, 2011 517 0.85 [0.76 , 0.93]
Kimiecik, 1992 332 0.83 [0.72 , 0.94]
Sheeran & Abraham, 2003 185 0.81 [0.67 , 0.96]
Boudreau, et al., 1995 86 0.78 [0.56 , 0.99]
Payne, et al., 2004 296 0.78 [0.66 , 0.89]
Rhodes, et al., 2003 305 0.78 [0.66 , 0.89]
Li & Chan, 2008 136 0.76 [0.59 , 0.93]
Rhodes, et al., 2005 585 0.74 [0.66 , 0.82]
Sheeran, et al., 2000 162 0.74 [0.59 , 0.90]
Beville et al., 2014; Females 42 0.73 [0.41 , 1.04]
Fife-Schaw, et al., 2007 209 0.73 [0.59 , 0.86]
Rhodes & De Bruijn, et al., 2010 179 0.73 [0.58 , 0.87]
Estabrooks & Carron, 1998 157 0.69 [0.54 , 0.85]
Norman, et al., 2005; Sample 1 58 0.69 [0.43 , 0.96]
Abraham & Sheeran, 2003; Study 1 254 0.68 [0.55 , 0.80]
MacCann, et al., 2015 1017 0.68 [0.62 , 0.74]
Rhodes, et al., 2006 230 0.68 [0.55 , 0.81]
Hagger, et al., 2007 202 0.65 [0.51 , 0.79]
Rivis, et al., 2003 225 0.65 [0.52 , 0.78]
Chatzisarantis, et al., 2007 444 0.63 [0.54 , 0.73]
Galea, et al., 2007 94 0.63 [0.43 , 0.84]
Rhodes, et al., 2005 241 0.62 [0.49 , 0.75]
Davies, et al., 2010 74 0.59 [0.36 , 0.82]
De Bruijn, et al., 2012 413 0.59 [0.49 , 0.69]
Eng & Martin Ginis, 2007 80 0.59 [0.37 , 0.81]
Bryan & Rocheleau, 2002 204 0.58 [0.44 , 0.71]
Budden & Sagarin, 2007 266 0.58 [0.46 , 0.70]
Conner, et al., 2007 146 0.58 [0.41 , 0.74]
Rhodes, et al., 2010 412 0.58 [0.48 , 0.67]
Rhodes, et al., 2012 216 0.58 [0.44 , 0.71]
Courneya, et al., 1999 66 0.56 [0.32 , 0.81]
Speed-Andrews, et al., 2012 600 0.56 [0.48 , 0.64]
Courneya, et al., 1998 131 0.54 [0.36 , 0.71]
Kraft, et al., 2005 110 0.54 [0.35 , 0.73]
McEachan, et al., 2010 427 0.54 [0.44 , 0.63]
Rhodes & De Bruijn, et al., 2010 158 0.52 [0.37 , 0.68]
Taut & Baban, 2012 35 0.52 [0.18 , 0.87]
Blanchard et al., 2008; Caucasians 197 0.51 [0.37 , 0.65]
Conroy, et al., 2013 63 0.51 [0.26 , 0.76]
Rhodes, et al., 2007 358 0.51 [0.41 , 0.61]
Beville et al., 2014; Males 200 0.50 [0.36 , 0.64]
Courneya & McAuley, 1995 62 0.50 [0.24 , 0.75]
Chatzisarantis & Hagger, 2008 180 0.48 [0.34 , 0.63]
Sheeran, et al., 1999 187 0.48 [0.34 , 0.63]
Carter-Parker, et al., 2012 139 0.47 [0.30 , 0.64]
Rhodes, et al., 2008 174 0.47 [0.32 , 0.62]
Rhodes, et al., 2010 153 0.47 [0.31 , 0.63]
Blanchard, et al., 2008; Caucasians 273 0.46 [0.34 , 0.58]
Hausenblas & Downs, 2004 104 0.46 [0.26 , 0.65]
Rhodes & Blanchard, 2008 206 0.45 [0.31 , 0.59]
Culos-Reed, et al., 2003 61 0.44 [0.18 , 0.69]
Rodgers, et al., 2008 278 0.44 [0.32 , 0.55]
Conner, et al., 2010; Sample 2 356 0.40 [0.30 , 0.50]
Presseau, et al., 2010 137 0.40 [0.23 , 0.57]
Courneya, et al., 2000 37 0.39 [0.05 , 0.72]
Kosma, et al., 2007 143 0.39 [0.22 , 0.55]
Blanchard et al., 2003 215 0.37 [0.23 , 0.50]
Lee, 2011 175 0.37 [0.22 , 0.51]
Molloy, et al., 2010 903 0.35 [0.29 , 0.42]
Plotnikoff, et al., 2010 524 0.35 [0.27 , 0.44]
Skar, et al., 2011 677 0.35 [0.28 , 0.43]
Mistry, et al., 2015 337 0.33 [0.22 , 0.44]
De Bruijn & Rhodes, 2011 538 0.32 [0.24 , 0.41]
Hagger & Chatzisarantis, 2006 241 0.31 [0.18 , 0.44]
Richetin, et al., 2010 132 0.30 [0.13 , 0.47]

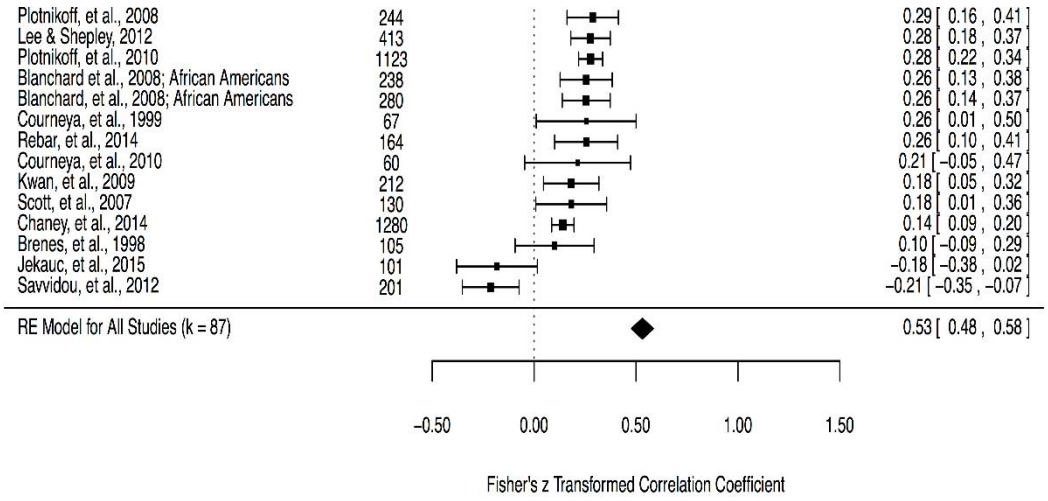


Figure 4. Correlations between intention and physical activity. Correlations (squares) and 95% confidence intervals (CI) are displayed for all effects entered into the meta-analysis. The diamond at the bottom represents Fisher's z-transformed correlation. *N* refers to the sample size of the studies.

Moderator Analyses

In these moderator analyses, the intercept of Fisher's z-transformed correlation coefficient obtained in the random-effects meta-analysis was regressed on the SES study characteristics (overall SES status, income, education, occupation) in subsequent meta-regression analyses.

Overall SES indicator. The overall SES indicator was available for all studies. In the meta-regression, overall SES was not a statistically significant moderator, $B = .04$, $p = .82$, SE = .04, 95% CI[-.05, .13], $Q_{model}(1) = .82$, $p = .36$. The alternative indicator (median split of SES indicator into high vs. low SES) also did not emerge as significant moderator, $B = .05$, $p = .48$, SE = .07, 95% CI [-.08, .17], $Q_{model}(1) = .51$, $p = .48$. This indicates that the significant heterogeneity in the correlation coefficients between intentions and physical activity between studies was not due to the overall socioeconomic status of the study samples (as shown in Table 2 and Forest plots in Appendix C).

Table 2

Meta-Analysis of the Relationship between Intention and Physical Activity moderated by overall SES and SES (median split)

	Intention and Physical Activity										
Moderators	*k*	*N*	M (SD)	Intercept	*B* (SE)	(95% CI)	*p*	$Q_{residuals}$	Q_{model}	I^2	R^2
SES Index	87	22975	3.68 (0.63)	0.35	.04 (0.04)	(-.05, .13)	.36	1322.43***	0.82	93.58%	0%
SES (median split)	87	22975	1.76 (0.43)	0.45	.05 (0.07)	(-.08, .17)	.48	1331.90***	0.51	93.59%	0%

Note.*$p < .05$, **$p < .01$, ***$p < .001$

Education. Information on educational attainment was available for 80 studies. In the meta-regression analysis, both education points and an indicator of high vs. low education (median split) emerged as significant moderators of the intention-physical activity-relation; $B = .11$, $p = .03$, SE = .05, 95% CI[.01, .22], $Q_{model}(1) = 4.73$, $p = .03$ for education points, explaining 5.68% of the variation, and $B = .16$, $p = .046$, SE = 0.08, 95%CI[.003, .31], $Q_{model}(1) = 4$, $p = .046$ for high vs. low education, explaining 4.75% of the variation in correlation coefficients. This means that the correlation between intentions and physical activity would increased by .11 for each one point increase in educational attainment, or that correlations differed by .16 between study samples with high and low education (as shown in Table 3, Figure 5 and Forest plots in Appendix C).

Table 3

Meta-Analysis of the Relationship between Intention and Physical Activity moderated by Education and Education (median split)

Moderators	Intention and Physical Activity										
	k	*N*	M (SD)	Intercept	*B* (SE)	(95% CI)	*p*	$Q_{residuals}$	Q_{model}	I^2	R^2
Education	78	21434	4.67 (0.51)	-0.03	.11* (0.05)	(.01 .22)	.03	1020.18***	4.74*	92.56%	5.68%
Education (median split)	78	21434	1.85 (0.36)	0.22	.16* (0.08)	(.003, .31)	.046	1029.22***	4*	92.60%	4.75%

Note.*p < .05, **p < .01, ***p < .001

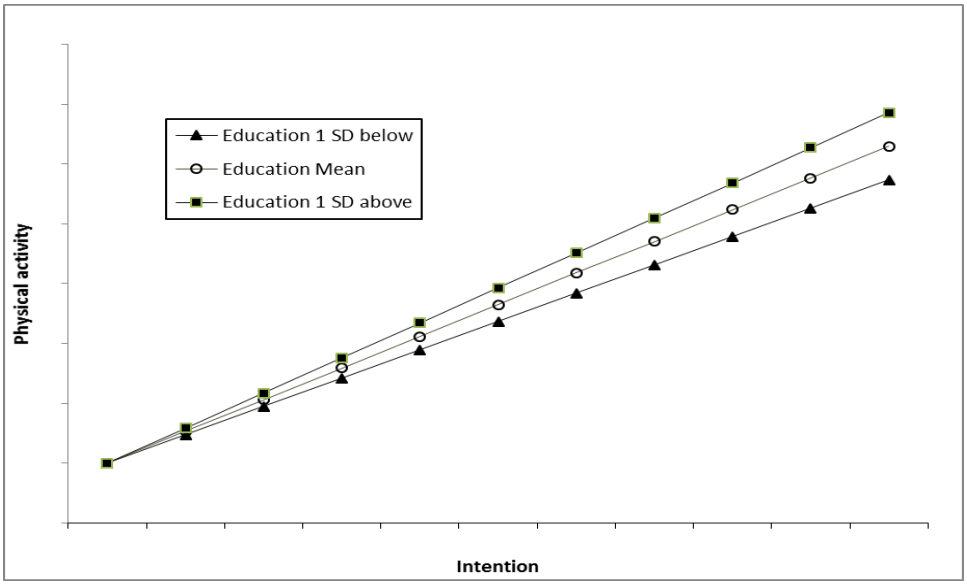


Figure 5. Plot of simple slope for education.

Occupation. Information on occupation was available for 5 studies. In the meta-regression analysis, both occupation points and an indicator of high vs. low occupation (median split) emerged as significant moderators of the intention-physical activity-relation; B = 7.64, p = .002, SE = 2.43, 95% CI[2.88, 12.40], $Q_{model}(1)$ = 9.9, p = .002 for occupation points, explaining 72.16% of the variation, and B = .76, p =

.002, SE = 2.43, 95%CI[.29, 1.24], $Q_{model}(1) = 9.9$, $p = .002$ for high vs. low occupation, explaining 72.16% of the variation in correlation coefficients. This means that the correlation between intentions and physical activity would increase by 7.64 for on point increase in occupation, or that correlation differed by .76 between study samples with high and low occupation (as shown in Table 4, Figure 6 and Forest plots in Appendix C).

Table 4

Meta-Analysis of the Relationship between Intention and Physical Activity moderated by Occupation and Occupation (median split)

	Intention and Physical Activity										
Moderators	*k*	*N*	M (SD)	Intercept	*B* (SE)	(95% CI)	*p*	$Q_{residuals}$	Q_{model}	I^2	R^2
Occupation	5	947	3.68 (0.04)	-27.33	7.64** (2.43)	(2.88, 12.40)	.002	26.38***	9.9**	88.83%	72.16%
Occupation (median split)	5	947	1.8 (0.45)	-0.58	.76** (2.43)	(.29, 1.24)	.002	26.38***	9.9**	88.38%	72.16%

Note.$p < .05$, **$p < .01$, ***$p < .001$

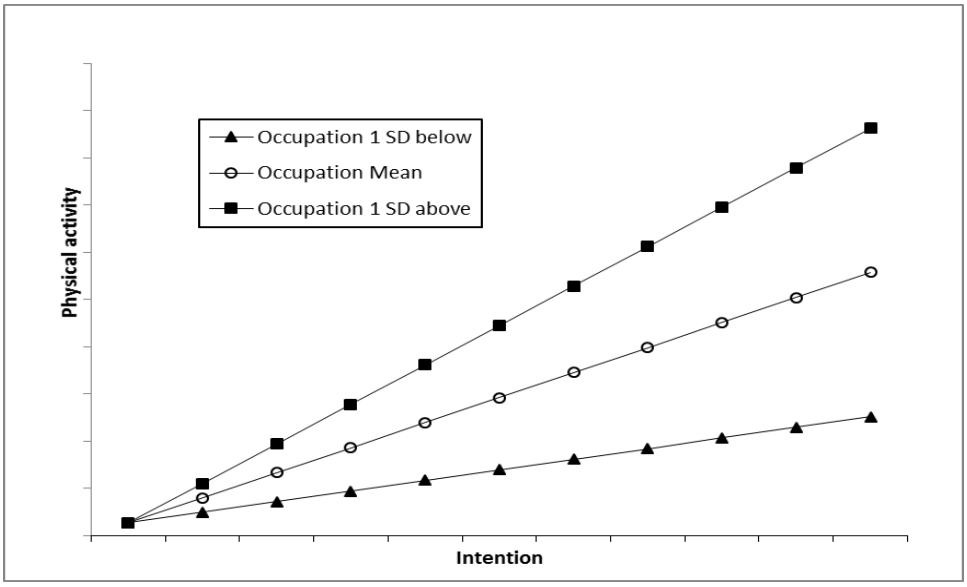


Figure 6. Plot of simple slope for occupation

Income. Information on income was available for 16 studies. In the meta-regression, both income points and an indicator of high vs. low income (median split) did not emerge as significant moderators of intention-physical activity relation; B = .04, p = .82, SE = .04, 95% CI[-.05, .13], $Q_{model}(1)$ = .32, p = .57 for income points and B = .05, p = .48, SE = .07, 95% CI [-.08, .17], $Q_{model}(1)$ = .51, p = .48 for high vs. low income (as shown in Table 5 and Forest plots in Appendix C).

Table 5

Meta-Analysis of the Relationship between Intention and Physical Activity moderated by Income and Income (median split)

	Intention and Physical Activity										
Moderators	*k*	*N*	M (SD)	Intercept	*B* (SE)	(95% CI)	*p*	$Q_{residuals}$	Q_{model}	I^2	R^2
Income	16	2817	3.69 (0.86)	0.40	.03 (0.05)	(-.06, .11)	.57	63.52***	0.32	73.95%	0%
Income (median split)	16	2817	1.33 (0.49)	0.40	.05 (0.08)	(-.11, .21)	.48	64.68***	0.35	73.48%	0%

Note.*p < .05, **p < .01, ***p < .001

The funnel plots are displayed in the Appendix D. Based on visual analysis it can be seen that the plots of the different meta-analyses after involving moderators are quite similar. Visual inspection suggests that the funnel plots are more or less symmetrical, with few studies outside the funnel, which suggests a low risk for publication bias (Egger, Smith, Schneider, & Minder, 1997).

Discussion

This study presents a systematic review of the literature on the relation between intention and physical activity in studies using the Theory of Planned Behaviour (Ajzen, 1991) and examined whether this relation was moderated by socioeconomic status (SES). The majority of the studies reviewed (85 out of 87) reported positive correlations between intentions and physical acvitity and intentions, and the average correlation for all study was .53, which indicates that intention explained 28% of the variance in physical activity and suggested that higher levels of intention were associated with higher frequency of physical activity. Both the I^2 and Q statistics were significant, which supports the hypothesis of substantial variance between the intention-physical activity-relation.

Moderator analyses using meta-regression revealed that the strength of the relationship between intention and physical activity did not vary by an overall SES indicator. However, the strength of the relationship did vary by individual SES indicators. Both occupation (explaining 72.16% of the variation in the pooled correlations) and education (explaining 5.68% of the variation in the pooled correlations) significantly moderated this relation, but income did not. This means that studies with samples with higher education or occupation report higher correlations between intention and physical activity, which suggests that these indicators of socioeconomic status indeed moderate the relationship between intentions and physical activity.

To account for potentially biased distributions and floor or ceiling effects, each indicator was split into high and low status using median split, and meta-regressions were conducted using these alternative indicators. Results from these

analyses were consistent with the analyses examining the more fine-grained SES measures. This suggests that there are discrepancies in high-low education and high-low occupation, suggesting that higher groups tend to be more consistent in translating their intention into PA than groups with lower education or occupational status.

Intention and Physical Activity

The findings of the review broadly replicate the findings on the relation between intention and physical activity as described in McEachan et al.'s (2011) systematic review, and provides support for the validity of the intention variable of the TPB model as the most proximal predictor of behaviour. Similar to this study, McEachan et al. (2011) reported substantial heterogeneity in this relation, even after considering a series of moderators. The result of the heterogeneity test in this study was in line with McEachan et al.'s (2011) review, indicating that there was a large amount of heterogeneity in the study correlations (I^2 = 93.14%).

Moderator Effects - Overall SES Indicator

The present review examined the hypothesised moderation by SES of the relationship between intention and physical activity and the analysis using the overall SES indicator that comprised of the highest level of SES did not have the moderatation effect. The present finding of the overall SES is in line with findings by Vasiljevic et al.(2015). Vasiljevic et al. (2015) followed a similar method to Conner et al. (2013) however, they measured SES using both individual- and are- level indices. Using both regression and meta analytic methods, they found no significant result of moderation SES on intention-behaviour relation. Vasiljevic et al. (2015) argued that different operationalizations of SES might lead to inconsisent results as

different definitions of SES capture different facets of relative deprivation. Similarly, the possible explanations for the non-replication of the findings from the Conner et al. (2013) study would be reasoned by the different measurements of SES. The present study employed the overall SES (education, occupation and income) for analysis, whereas Conner et al. (2013) only applied single-indicator measures (i.e., occupation types alone) of SES. The present non-significant result might be due to the effects varied among individual indicators as income did not moderate the intention-activity relation. This difference of measurement might lead to the inconclusive findings of moderation effect of SES. Therefore, looking at different facets of SES could provide more specific information on the funciton of each SES indicator to intention-physical activity relation.

Individual Indicators

Education. Education was a significant moderator for the intention-physical activity-relation. This result supports a number of previous studies indicating that education moderated the intention-behaviour relationship (Godin et al., 2010; Conner et al., 2013). Higher education is associated with stronger intention for physical activity, and this positive relationship might be due to the strong association between education and stable intentions. This stable intentionality is conceptualised as temporal stability, which can be defined as the extent to which cognitions remain consistent over time regardless of whether it is challenged. (Cooke & Sheeran, 2004). Temporal stability is generally measured by the within-participants correlation between cognition items taken at two different time points, and a meta-analytic review found that temporal stability had a strong moderating effect on the intention-behaviour consistency with a large effect size (Cooke & Sheeran, 2004). It is

suggested that individuals with high levels of temporary stability could shield important cognitions (i.e. internal intentions) from competing cognitions (i.e. external barriers), which in turn improve the consistency to act on the intention to behaviour (Cooke & Sheeran, 2004). Godin et al. (2010) found that higher education was associated with more stable intentions and high levels of temporal stability, this sheds light on the reason for present findings of moderation effect of education on intention-physical activity relation. It is believed that education might foster individuals with better temporal stability, such that well-educated people are better able to maintain a stable intention for physical activity (Godin et al., 2010).

In addition, better-educated individuals are assumed to have more cognitive resources including planning skills. Planning skill is a cognitive skill that individuals employ to organise their behaviour with a series of intermediate steps (i.e. plan), such that a specified goal can be accomplished by using the structured (concrete) plan (Allan, Sniehotta, & Johnston, 2013). Research has shown that by improving individual's planning skill, through planning intervention in forming implementation intention, could improve goal attainment as well as affecting behavioural change (Gollwitzer, 1999, Allan et al., 2013). In this regard, higher education is associated with better planning skills, and research shows that individuals with higher educational attainment have better ability to translate the health-related information into adaptive behaviours (Goldman et al., 2011). Furthurmore, Schüz, Wolff, Warner, Ziegelmann, and Wurm (2014) found that more health-conscious individuals are more likely to translate intentions into concrete plans for action, which in turn might improve the predictive value of intentions.

Furthermore, education generally confers greater access to salubrious resources, including a fulfilling job, a better sense of personal control and a healthy lifestyle (Mirowsky & Ross, 2003). These facilitate individuals to maintain or uptake physical activity. Therefore, both physical and cognitive advantages of higher education might have benefited people to form more stable and more realistic intentions which in turn improve their likelihood of translations into action.

Occupation. Occupation also was a significant moderator of the intention-physical activity-relationship. Higher correlations between intention and physical activity were found in samples with higher occupational status. This result replicates the findings from Conner et al. (2013), but is in contrast to Vasiljevic et al. (2015) which found no moderating effects of occupational status.

It is suggested that occupation could be a proximal variable for education (Mäkinen et al., 2012). A study exploring a longitudinal data set of nearly 5000 adults found that education is the strongest predictor of the promotions and upgrading of occupational attainment (Cheng & Furnham, 2012). In this regard, occupation might share similar attributes of education which contributed to the present significant result. In addition, a longitudinal research shows that there was a positive relationship between self-efficacy and objective career success (Abele & Spurk, 2009). Abele and Spurk (2009) argued that the higher the self-efficacy had been at career entry, the more they earned and the higher was their status later on. Furthermore, using an objective measure of salary and hieharchical status, results found a positive association amongst self-efficacy, job status and income. In this regard, it is believed that people with higher occupational status might have more finanical resources to spend on the leisure facility, which in turn facilitate ones to

uptake and maitntain physical activity. Apart from finanical resources, it is possible that higher-status jobs provide people with more degrees of freedom including flexible work hours or better working environment which supports physical activity, and in turn might make physical activity easier to uptake even during the working hours.

In addition, self-efficacy refers to individuals' beliefs about their capability to perform some behavior or to meet a standard, and it has been found to be a key determinant in increasing physical activity (Bandura, 1977; Bauman, at el., 2012) and a strong predictor of intention (Hagger, Chatzisarantis. & Biddle, 2002). In this regard, it is believed that inviduals with high status jobs might have higher efficacy to be physically active, and hence contribute to the consistency between intention and physical activity.

Income. Income was not a significant moderator of the relation between intention and physical activity. This finding is in contrast to previous research, for example Conner et al. (2013) suggested that economic resource might have an impact on intention to behaviour, and they found that people from less deprived areas were were more likely to act in line with their intentions, as compared to their counterpart. However, the present study and the Conner et al.'s (2010) studty examined different types of behaviour (breastfeeding vs. physical activity), and the indicator for income used in the Conner et al. study was derived from area-based deprivation data rather than individual data. Nevertheless, this finding is interesting, as it could be hypothesised that income would exert particularly strong moderator effects on the intention-behaviour relation. However, for some types of physical activity, money might not affect the availability for action, i.e. running, walking,

jogging and so on. Further research should study the effects of income on the relation between intentions and different types of physical activity.

In addition, most studies reported in the present review reported household income data. It is possible that the results would be different if individual income had been reported: While household income represents economic resource of one family, it might not be most representative for an individual. The present result generally reflects the inactivity of one family but an individual. Thus, contrary to our expectation, income did emerge as significant moderator of the intention-physical activity relation.

Implications

There are some implications for future studies: From a theoretical viewpoint, the present review provides a more updated view on the relation between intention and physical activity compared to previous reviews (McEachan et al., 2011). The findings regarding SES and TPB support the predictive value of intention on behaviour. From the analysis of 87 studies, intention appeared to be the most proximal predictor of physical activity, and moderators analysis also imply that translating individual intention into behaviour can be facilitated or impeded by socioeconomic status.

The present study employed both composite SES indicator and individual indicator for analysis, which provided more information on the influence and potential mechanisms of different SES facets on the intention-behaviour relation. In addition, the present study supported previous findings as arguing that different operationalization of SES might yields inconclusive results amongst studies. Therefore, the measurement of SES which the present study adopted might provide a

standardised measure for SES (Lampet et al., 2013). While this point system weighted three dimensions – education, occupation and income - to metric scales with index ranged from 1 to 7, the advantages of its standardization and the simple operationalization might benefit for future replication.

However, despite significant moderator effects of SES, there generally remained large amounts of heterogeneity. Both Q and I^2statistic remained significant after SES had been considered. Thus, there might be other moderators that can explain the remaining variance, and future studies should investigate other facets of SES, i.e. individual- and area- level of SES, social class, race and ethnicity.

From a practical viewpoint, the findings for education and occupation show that discrepancies in SES affect individuals' ability to translate intention into physical activity. The issue of physical inactivity is very likely to occur in the groups with low SES, in particular, the groups with lower educational level or with lower status jobs. To support these low-SES groups, intervention should focus on the methods that could promote individual to form a realistic and concrete intention to behaviour. Allan et al. (2013) suggested that improving individual's planning skill, through planning intervention in forming implementation intention, could improve goal attainment as well as affecting the behavioural change (Gollwitzer, 1999). This planning intervention is derived from Action Planning Theory and people are taught to link goal-directed behaviours to situational or internal cues by specifying 'when', 'where', and 'how' to act in advance (Sniehotta, Schwarzer, Scholz, & Schüz, 2005). These cues promote individuals to initiate action, and those who generate this action plan are more likely to achieve their intentions (Allan et al., 2013). Further, individuals with good planning skills are better in forming the action plan, which in

turn facilitate them to generate the concrete intention towards action. Returning to the intention-physical activity relationship, people would benefit from planning skill intervention; this intervention cultivated ones to be ‘good’ planner which in turn facilitate them to generate the action plan. Thus, having an action plan might support individuals to implement their intention to participate in physical activity.

For external cues, it is possible to strengthen individual’s intention to physical activity by providing more environmental cues of physical activity. Given that individuals with lower SES have limited resources and choices, it is especially important to provide more supports to tackle these barriers. Research found that ‘environmental triggers’ was a significant moderator for intention-behaviour relation (Booker & Mullan, 2013), and it showed that individuals with more exposures to environmental cues will be more likely to maintain healthy lifestyle. While environmental cues are not limited to the built environments or established facilities, these also include the factors such as physical, sensory, social, internal, and emotional drive (Booker & Mullan, 2013). In this regard, interventions would not be limited to infrastructural change, these supports could be extended to cover the sensory, social and emotional drive triggers. For instance, promotion of health message of physical activity such as leaflets, posters or graphic advertising might provide supports on the internal and sensory triggers; encouragements for outdoor activity might provide supports on emotion drive and social trigger. With this, by introducing and diversifying the environmental cues on physical activity, which in turn provide more supports for individuals, whereby improving intentions for low-SES groups and increasing the likelihood of performing physical activity.

Income appeared to be irrelevant in affecting intention to physical activity, and this contrasts the argument by Conner et al. (2013) that resource deprivation leads to intended behaviours being suppressed. Low-income groups tend to be more resource deprived, and it is suggested that this disadvantage might hinder the availability for physical activity (Romero, 2005), such as the lack of recreational facilities, unsafe neighbourhood and traffic conditions. However, as some types of physical activity do not involve any (or higher) cost, such as running, walking or swimming in beach, disposable income might not have affected the degree to which intentions predict action.

Therefore, future research would benefit from examining income on different types of health behaviours, so as to understand the true effect of the impact of economic resource.

Strengths

There are some strengths to the present meta-analysis. The notable strength is the consistency with previous reviews. The present review identified the relevant studies using the similar search method from McEachan et al.'s study (2011). For studies prior to 2010, the reference list from this review was searched for examining physical activity and reporting relevant SES information. For studies since 2010, the search terms from previous review (Machean at el, 2011) were applied with specifying physical activity. Using this method, the consistent findings in present review provided an updated view on the relation between intention and physical activity, which demonstrated the strong predictive value of intention to behaviour.

Another strength of the present view is the large quantity of eligible studies. The present study identified 82 articles with 90 studies being eligible for analysis. With

larger amount of studies for moderator analysis, the present review gained more power for estimating the true effect sizes, despite fewer studies for occupation. In addition, the present review was a larger study, as compared to preview view by Vasiljevic et al. (2015), in examining the moderation effect of SES on the variables of TPB model and physical activity, and findings from the present review might provide additional information on the moderation effect of SES. Adding further strength of present review is the operationalization of SES index. Studies included in the current analysis used both overall and individual measure of SES, in addition to the use of standardised point system, the analysis provided more information on the influence and potential mechanisms of different SES facets on the intention-behaviour relation. Further, the findings from both overall and individual SES are in line with argument by Vasiljevic et al. (2015) that different operationalisations of SES might result in inconclusive result of SES analysis. This result hints that future studies should provide clear definitions of SES when examining the role of SES.

Limitations

There were some limitations to the present meta-analysis. First, study search was conducted in two databases only – *Scopus* and *Web of Science*, which bears the risk of missing studies. However, these databases have the largest coverage of articles in the Psychology and Health areas, thus it is unlikely that many studies remained undetected. Second, regarding the studies characteristics, although there was a substantial amount of studies available for analysis (k = 87, n = 22975), studies selected tended to be drawn from specific populations, which might raise concern on the bias of results. For instance, studies selected were mainly from English speaking countries, were mainly using the self-report method as measurement, and the samples

were largely having drawn from university. While characteristics of the studies were not equally weighted, this might lead to biased results. Future studies should attempt to select studies from non-English speaking countries, which might gain more information on cultural influence. Third, present studies classified the SES based on the demographic information from the majority of the sample in each study. Thus, the classification may not be the best representative of the study. A further limitation lies in the fact that no study reported an actual correlation between SES, intentions and physical activity. If this information had been available, more sophisticated analyses would have been possible. Future studies, therefore, should provide inter-correlations of SES and behaviour, which might facilitate further research on the moderating effects of SES. Fourth, the present review did not control for different types of physical activity, and it is possible that the relation between intention and behaviour differs between types of physical activity. Thus, future studies should consider also the effect of different types of behaviour. Fifth, the studies in this review tended to report significant correlation between intention and physical activity. It is possible that studies that found non-significant result have not been published, which might lead to a publication bias. However, visual inspection suggests that the funnel plots (as shown in Appendix D) are more or less symmetrical, with few studies outside the funnels, which suggests a low risk for publication bias. Last, the SES classification used in the present review (Lampet et al., 2013) might be biased or based on selective research. However, this system currently is the only SES classification available that allows to compare different SES indicators. In addition, it is a significant advancement over previous studies that

employed median split in classifying SES, as it allows for more fine-graded analyses and more information.

Conclusions

The current systematic review demonstrated that intention, as conceptualised in the model of the Theory of Planned Behaviour (Ajzen, 1991), is a strong and reliable predictor of physical activity. Operationalisation of socioeconomic status was conducted by following a standardised point system (Lampart at el., 2014) which weighted three dimensions – education, occupation and income - into metric scales. It was found that individual indicators of socioeconomic status, namely education and occupation were significant moderators of this relationship, while an overall SES indicator and income were not. This suggests that higher education or occupational status is associated with higher intention-physical activity consistency. The present findings can inform the design of interventions to provide more support and resources for different SES groups, such that intervention including fostering planning skills and diversifying environmental cues, might strengthen intentions for engagement in physical activity. It further suggests that individual socioeconomic status plays an important role in the realisation of physical activity, in particular, a clear definition of socioeconomic status might benefit the interpretation of the effect of the specific socioeconomic status.

References

(Studies marked with an asterisk * were included in the systematic review and meta-analysis

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Figures

Tab. 1 Calculation basis for the index of the socioeconomic status (SES Index) in DEGS1 (2012) For information on how points are awarded, cf. Lampert et al. [4]

Points	School and professional qualification	Professional status of respondents or of the head of household	Net equivalent income
1.0–1.9	No school *and* no professional qualification (1a: 1.0) Certificate of Primary Education ("Hauptschulabschluss") *and* no vocational qualification (1b: 1.7)	Farmer: 10 ha and more (1.0) Farmer, no details provided (1.0) Farmer: Under 10 ha (1.1) Unskilled workers (1.3) Semi-skilled workers (1.8) Workers, no details provided (1.9)	≤491 € (1.0) 492–683 € (1.5)
2.0–2.9	Certificate of Secondary Education ("Mittlerer Schulabschluss", "Realschulabschluss") or POS certificate and no vocational qualification (2b: 2.8)	Foreman, group leader (2.0) Skilled or specialist tradesmen (2.1) Master, site foreman, overseer, (2.4) Employees with executing responsibilities (2.4) Others, no details provided (2.9) Civil servants in Lower Service (2.9)	684–815 € (2.0) 816–921 € (2.5)
3.0–3.9	No school or primary certificate *and* training/apprenticeship/ vocational school (1c: 3.0) Certificate of Secondary Education, POS *and* training/apprenticeship/vocational school (2a: 3.6) Technical college qualification ("Fachhochschulreife"), University Entrance Qualification ("Abitur"), EOS *and* no vocational qualification (2c-gen: 3.7)	Self-employed: no staff (3.5) Employees doing qualified work (3.6) Self-employed: 1–4 staff (3.6) Employees, no details given (3.7) Self-employed in trading, business etc. (3.9)	922–1082 € (3.0) 1083–1188 € (3.5)
4.0–4.9	Technical college qualification, University Entrance Qualification, EOS *and* training/apprenticeship/vocational school (2c-voc: 4.8)	Self-employed or freelancer, no details given (4.0) Civil servants in Intermediate Service (4.1) Employees in a position of responsibility (4.2) Self-employed: 5 or more employees (4.2) Self-employed: PGH member (4.2) Employees with extensive leadership responsibilities (4.7)	1189–1310 € (4.0) 1311–1417 € (4.5)
5.0–5.9	Category not taken	Civil servants, no details given (5.0) Civil servants in Higher Service (5.2) Freelancers: no employees (5.8)	1418–1619 € (5.0) 1620–1833 € (5.5)
6.0–7.0	Technical college qualification, University Entrance Qualification, EOS *and* Bachelor, Technical College Diploma (3a: 6.1) Technical college qualification, University Entrance Qualification, EOS *and* Master/Magister/Diploma, PhD (3b: 7.0)	Freelance academics (6.2) Civil servants in Highest Service (6.4) Freelancers: 1–4 employees (6.8) Freelancers: 5 or more employees (7.0)	1834–2125 € (6.0) 2126–2692 € (6.5) ≥2693 € (7.0)

POS Polytechnic Secondary School ("Polytechnische Oberschule"), *EOS* Extended Secondary School ("Erweiterte Oberschule"), *PGH* Craftmen's Production Cooperatives ("Produktionsgenossenschaften des Handwerks").

Figure 3. Calculation basis for the index of the socioeconomic status (SES Index). For information on how points are awarded. Adapted from Lampert, T., Kroll, L., Müters, S., & Stolzenberg, H. (2013). Measurement of socioeconomic status in the German health interview and examination survey for Adults (DEGS1). Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz. 56(5-6), 631-636. doi: 10.1007/s00103-012-1663-4.

Appendix A: PRISMA Checklist for the Reporting of Systematic Reviews

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1-5
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	6
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	7-16, Figure 1
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	16
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	N/A
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	18
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	17

Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	17, Figure 2
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	18-20 Figure 2
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	21
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	21-22, Figure 3
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	32, Appendix D
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	22-24
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	25
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	18-20, Figure 2
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	15, Appendix B
Risk of bias within	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	N/A

studies			
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	25-31, Table 1-4, Appendix C
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	25-31 Table 1-4
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	32, Appendix D
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	33-42
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	43-44
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	44-45
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	N/A

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 6(6): e1000097. doi:10.1371/journal.pmed1000097

Appendix B: Data Extraction and Study Characteristics

Short reference	Country of Study	Details of Behaviour	Instrument of measure	Follow-up Weeks	N INT-BEH	R INT-BEH	Education (Points)[1]	Income (Points)[1]	Occupation (Points)[1]	SES (Median Split)	SES Points[2]
(Abraham & Sheeran, 2003), Study 1	United Kingdom	Self-reported physical activity	2 items measure	2	254	.59	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Beville, Meyer, Usdan, Turner, Jackson, & Lian, 2014), Male Sample	United States	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	0	200	.46	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Beville, Meyer, Usdan, Turner, Jackson, & Lian, 2014), Female Sample	United States	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	0	421	.62	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Blanchard, Courneya, Rodgers, Fraser, Murray, Daub, & Black, 2003)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	8	215	.35	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Blanchard, Fisher, Sparling, Nehl, Rhodes, Courneya, & Baker, 2008), Caucasians	United States	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	0	197	.47	Undergraduate Students (4.8)	-/-	-/-	2	4.8

(Blanchard, Fisher, Sparling, Nehl, Rhodes, Courneya, & Baker, 2008), African American	United States	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	0	238	.25	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Blanchard, Kupperman, Sparling, Nehl, Rhodes, Courneya, Baker, & Rupp, 2008), Caucasian	United States	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	8	273	.43	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Blanchard, Kupperman, Sparling, Nehl, Rhodes, Courneya, Baker, & Rupp, 2008), African American	United States	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	8	280	.25	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Boudreau, Godin, Pineau, & Bradet, 1995)	United States	Self-reported physical activity	6 items measure	8	86	.65	-/-	-/-	Clerical and Blue Collar Worker (3.7)	1	3.7
(Bryan & Rocheleau, 2002)	United States	Self-reported physical activity	3 items measure	13	204	.52	Undergraduate Students (4.8)	-/-	-/-	2	4.8

(Brickell, Chatzisarantis, & Pretty, 2006)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	5	149	.69	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Brenes, Strube, & Storandt, 1998)	United Kingdom	Self-reported physical activity	1 item measure	39	105	.10	13.6 years Education in UK (4)	-/-	-/-	1	4
(Budden & Sagarin, 2007)	United States	Self-reported physical activity	Dichotomous exercise behaviour measure	1	266	.52	A Majority has 16+ years Education (6.1)	-/-	-/-	2	6.1
(Carter-Parker, Edwards, & McCleary-Jones, 2012)	United States	Self-reported physical activity	International physical activity questionnaire (IPAQ)	6	139	.44	-/-	Majority has Household Income less than US$20,000 (3)	-/-	1	3
(Chatzisarantis, Frederick, Biddle, Hagger, & Smith, 2007)	United Kingdom	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	0	444	.56	Secondary & Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Chatzisarantis & Hagger, 2008)	United Kingdom	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	5	180	.45	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Chaney, Bernard, & Wilson, 2014)	United States	Self-reported physical	Online survey and emails	0	1280	.14	Undergraduate Students (4.8)	-/-	-/-	2	4.8

		activity (Walking)									
(Courneya, Keats, & Turner, 2000)	Canada	Self-reported physical activity (Cycling and walking)	Exercise log	2	37	.37	Majority has Completed University (4)	Majority has Family Income more than C$40,000 (3.5)	-/-	1	4
(Conner, & Abraham, 2001)	United Kingdom	Self-reported physical activity	6 items measure	2	123	.83	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Conner, Rodgers, & Murray, 2007)	United Kingdom	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	1	146	.52	University Students (4.8)	-/-	-/-	2	4.8
(Conner, Sandberg, & Norman, 2010), Sample 1	United Kingdom	Self-reported physical activity	2 items measure	2	777	.70	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Conner, Sandberg, & Norman, 2010), Sample 2	United Kingdom	Self-reported physical activity	2 items measure	0	356	.38	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Courneya, Stevinson, McNeely, Sellar, Peddle, Friedenreich, Mazurek, Chua, Tankel, Basi, & Reiman, 2010)	Canada	Attendance Recorded (Aerobic)	Recorded by fitness trainers and included attendance	12	60	.21	Majority was Undergraduate Students (4.8)	Majority has Annual Family Income more than C$60000 (3.5)	-/-	2	4.8

(Conroy, Elavsky, Doerksen, & Maher, 2013)	United States	Self-reported physical activity	2 items measure	0	63	.47	Undergraduate Students (4.8)		-/-	2	4.8
(Courneya & McAuley, 1995)	United States	Attendance record	Card returning	4	62	.46	-/-	Majority has Annual Family Income more than US$40000 (4)	-/-	1	4
(Courneya, Nigg, Estabrooks, & Courneya, 1998)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	156	131	.49	Majority has At Least High School Level (3.7)	Majority has Annual Family Income less than C$40000 (2.5)	-/-	1	3.7
(Courneya, Bobick, & Schinke, 1999)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	11	67	.25	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Courneya, Friedenreich, Arthur, & Bobick, 1999)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	17.33	66	.51	Majority has Secondary Level (3.7)	Majority has Annual Family Income less than C$40,000 (3.5)	-/-	1	3.7

(Culos-Reed, & Brawley, 2003)	Canada	Self-reported physical activity	1 item measure	4	61	.41	-/-	Majority was Average SES with less than C$40,000 (2)	-/-	1	2
(Davies, Mummery, & Steele, 2010)	Australia	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	2	74	.53	Majority has Technical and Further Education (3.7)	Majority has Household Annual Income AUD$25,000-50,000 (3.5)	-/-	1	3.7
(De Bruijn & Rhodes, 2011)	Netherland	Self-reported physical activity	International physical activity questionnaire (IPAQ)	0	538	.31	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(De Bruijn, Verkooijen, De Vries, & Van Den Putte, 2012)	Netherland	Self-reported physical activity	International physical activity questionnaire (IPAQ)	2	413	.53	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Eng & Martin Ginis, 2007)	United States	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	1	80	.53	Majority has Secondary Level (3.7)	Majority has Annual Household Income US$30,000 – 59,999 (3.5)	-/-	1	3.7

(Estabrooks & Carron, 1998)	Canada	Attendance Record	2-3 times per weeks, 16 weeks	4	157	.60	Majority has Undergraduate Level (4.8)	-/-	-/-	2	4.8
(Fife-Schaw, Sheeran, Norman, & Fife-Schaw, 2007)	United Kingdom	Self-reported physical activity	2 items measure	2	209	.62	Undergraduate Student (4.8)	-/-	-/-	2	4.8
(Galea, Bray, & Bray, 2007)	Canada	Self-reported physical activity (walking)	Physical Activity Scale for the Elderly	4	94	.56	Majority has Secondary Level (3.7)	-/-	-/-	1	3.7
(Hagger & Chatzisarantis, 2006)	United Kingdom	Self-reported physical activity	1 item measure	2	241	.30	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Hagger, Chatzisarantis, & Harris, 2006)	United Kingdom	Self-reported physical activity	2 items measure	2	261	.75	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Hagger, Anderson, Kyriakaki, & Darkings, 2007)	United Kingdom	Self-reported physical activity	2 items measure	2	202	.57	Undergraduate & Graduate Students (4.8)	-/-	-/-	2	4.8
(Hardeman, Kinmonth, Michie, & Sutton, 2011)	United Kingdom	Objective physiological measure	dayPAR - ratio of daytime to resting energy expenditure, estimated	48	236	.76	-/-	-/-	A Majority has Professional & Managerial Jobs (3.7)	1	3.7

			(heart rate monitoring)								
(Hardcastle, Blake, & Hagger, 2012)	United Kingdom	Self-reported physical activity	International physical activity questionnaire (IPAQ)	24	-/-	-/-	-/-	Majority was identified as Low SES (3.5)	-/-	1	3.5
(Hausenblas & Downs, 2004)	United States	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	13	104	.43	Half of The Sample has Undergraduate Level (3.7)	Majority has Annual Family Income US$40000-100000 (4)	-/-	1	4
(Holderness, & Hunton, 2010)	United States	Self-reported physical activity	4 items measure	0	-/-	-/-	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Jekauc, Volkle, Wagner, Mess, Reiner, & Renner, 2015)	Germany	Attendance record	Magnetic card record	20	101	-.18	Undergraduate Student (4.8)	-/-	-/-	2	4.8
(Kimiecik, 1992)	United States	Self-reported physical activity	1 item measure + Exercise Activity Questionnaire	4	332	.68	-/-	Majority has Sum of Annual Income more than US$50000 (5)	-/-	2	5

(Kosma, Eills, Cardinal, Bauer, & McCubbin, 2007)	United States	Self-reported physical activity	Physical Activity Scale for the Elderly	26	143	.37	Majority has Undergraduate Level (4.8)	-/-	-/-	2	4.8
(Kosma, 2014)	United States	Self-reported physical activity	Physical Activity Scale for Individuals with Physical Disabilities (PASIPD)	0	-/-	-/-	Majority has High School/General Equivalency Diploma or Less (3.7)	Majority has Annual Income less than US$ 20000 (3)	-/-	1	3.7
(Kraft, Rise, Røysamb, & Sutton, 2005)	Norway	Self-reported physical activity	Dichotomous variable measure	2	110	.49	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Kwan, Bray, & Ginis, 2009)	United States	Self-reported physical activity	1 item measure	8	212	.18	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Lee, 2011)	United States	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	1	175	.35	Majority has Some College Education (5)	-/-	-/-	2	5
(Lee & Shepley, 2012)	Korea	Self-reported physical activity (Walking)	Physical Activity and Quality of Life Questionnaire	0	413	.273	Majority has Some College Level Education (3.7)	-/-	-/-	1	3.7

(Li & Chan, 2008)	Hong Kong	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	2	136	.64	Majority was Undergraduate Students (4.8)	-/-	-/-	2	4.8
(MacCann, Todd, Mullan, & Roberts, 2015)	Australia	Self-reported physical activity	5 items measure	1	1017	.59	College Students (4.8)	-/-	-/-	2	5
(McEachan, Sutton, & Myers, 2010)	United Kingdom	Self-reported physical activity	1 item measure	2	427	.49	Postgraduate Students (6.1)		-/-	2	6.1
(Mistry, Sweet, Latimer-Cheung, & Rhodes, 2015)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	4	337	.32	Majority has Some University Level (4.8)	Majority has Annual Income C$35,000-64,000 (5)	-/-	2	5
(Molloy, Dixon, Hamer, & Sniehotta, 2010)	United Kingdom	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	7	903	.34	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Norman, & Conner, 2005) Sample 1	United Kingdom	Self-reported physical activity	Multi-item measure	2	58	.60	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Norman, & Conner, 2005) Sample 2	United Kingdom	Self-reported physical activity	Multi-item measure	1	76	.70	Undergraduate Students (4.8)	-/-	-/-	2	4.8

(Payne, Jones, & Harris, 2002)	United Kingdom	Self-reported physical activity	A dichotomous measure + A continuous measure	1	199	.84	-/-	-/-	Employees, no details given (3.7)	1	3.7
(Payne, Jones, & Harris, 2004)	United Kingdom	Self-reported physical activity	1 item measure	1	296	.65	-/-	-/-	Employees, no details given (3.7)	1	3.7
(Plotnikoff, Courneya, Trinh, Karunamuni, & Sigal, 2008)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	12	244	.28	Completed University & University Level (4.8)	Majority has Annual Family Income C$20,000-39,999 (3.5)	-/-	2	4.8
(Plotnikoff, Lippke, Courneya, Birkett, & Sigal, 2010) - Type 1 diabetes sample	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	26	524	.34	Less than a Half has University Degree (4)	-/-	-/-	1	4
(Plotnikoff, Lippke, Courneya, Birkett, & Sigal, 2010) - Type 2 diabetes sample	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	26	1123	.27	Less than a Half has University Degree (3.5)	-/-	-/-	1	3.5
(Presseau, Sniehotta, Francis, & Gebhardt, 2010)	United Kingdom	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	8	137	.38	Undergraduate Students (4.8)	-/-	-/-	2	4.8

(Rebar, Maher, Doerksen, Elavsky, & Conroy, 2014)	Australia	Self-reported physical activity (Walking)	International physical activity questionnaire (IPAQ)	0	164	.25	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Rhodes, Jones, & Courneya, 2002)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	2	192	.71	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Rhodes, & Courneya, 2003)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	4.33	305	.65	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Rhodes, & Courneya, 2005)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	2	585	.63	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Rhodes, & Matheson, 2005)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	2	241	.55	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Rhodes, Blanchard, Matheson, & Coble, 2006)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	2	230	.59	Undergraduate Students (4.8)	-/-	-/-	2	4.8

(Rhodes, Courneya, Blanchard, & Plotnikoff, 2007)	Canada	Self-reported physical activity (Walking)	Godin Leisure Time Exercise Questionnaire (GLTEQ)	8	358	.47	Majority has University Degree (5)	Majority has Annual Family Income more than C$40,000 (5)	-/-	2	5
(Rhodes & Blanchard, 2008)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	2	206	.42	Majority has University Degree (6)	Majority has Annual Family Income more than C$40,000 (5)	-/-	2	6
(Rhodes, & Blanchard, 2008) Combined Sample	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	2	174	.44	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Rhodes & De Bruijn, 2010) Moderate Condition	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	2	158	.48	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Rhodes & De Bruijn, 2010) Vigorous Condition	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	2	179	.62	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Rhodes, De Bruijn, & Matheson, 2010)	Canada	Self-reported physical activity	Godin Leisure Time Exercise	2	153	.44	Undergraduate - College Students (4.8)	-/-	-/-	2	4.8

			Questionnaire (GLTEQ)								
(Rhodes, Hunt Matheson, & Mark, 2010)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	2	412	.52	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Rhodes, Fiala, & Nasuti, 2012)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	2	216	.52	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Rivis, & Sheeran, 2003)	United Kingdom	Self-reported physical activity	1 item measure	2	225	.57	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Richetin, Sengupta, Perugini, Adjali, Hurling, Greetham, & Spence, 2010)	Italty	Self-reported physical activity	International physical activity questionnaire (IPAQ)	1	132	.29	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Rodgers, Conner, & Murray, 2008)	United Kingdom	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	1	278	.41	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Savvidou, Lazuras, & Tsorbatzoudis, 2012)	Australia	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	0	201	-.21	A Majority has Completed High School (3)	-/-	-/-	1	3

(Scott, Eves, French, & Hoppe, 2007)	United Kingdom	Self-reported physical activity (Walking)	1 item measure	1	130	.18	-/-	-/-	Employees, no details given (3.6)	1	3.6
(Sheeran, & Orbell, 2000)	United Kingdom	Self-reported physical activity	1 item measure	2	162	.63	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Sheeran & Abraham, 2003)	United Kingdom	Self-reported physical activity	2 items measure	2	185	.67	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Sheeran, Norman, & Orbell, 1999)	United Kingdom	Self-reported physical activity	Multi-items measure	2	187	.45	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Skar, Sniehotta, Molloy, Prestwich, & Araujo-Soares, 2011)	United Kingdom	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	13	677	.34	Undergraduate Students (4.8)	-/-	-/-	2	4.8
(Speed-Andrews, Rhodes, Blanchard, Culos-Reed, Friedenreich, Belanger, & Courneya, 2012)	Canada	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	4	600	.51	Undergraduate Students (4.8)	Majority has Annual Family Income less than C$59,999 (3.5)	-/-	2	4.8
(Taut & Baban, 2012)	Romania	Self-reported physical activity	Godin Leisure Time Exercise	0	35	.48	Undergraduate Students (4.8)	-/-	-/-	2	4.8

			Questionnaire (GLTEQ)								
(Wang, 2011)	United States	Self-reported physical activity	Godin Leisure Time Exercise Questionnaire (GLTEQ)	4	517	.69	Undergraduate Students (4.8)	-/-	-/-	2	4.8

Note. [1] Points derived from international coding system in Lampert, Kroll, Müters & Stolzenberg (2013). [2]SES Points are the maximum points derived from education, income and occupation indicators for those studies that reported multiple SES indicators. Physical activity refers to general physical activity (i.e., amount of physical activity in general measured by self-report) unless specific physical activity type is mentioned. Studies that did not indicate whether university students were under- or postgraduate were coded as undergraduate students (4.8). Studies that did not indicate the occupations of participants were coded as "Employees, no details given" (3.7).

Appendix C: Forest Plots for Moderator Analyses

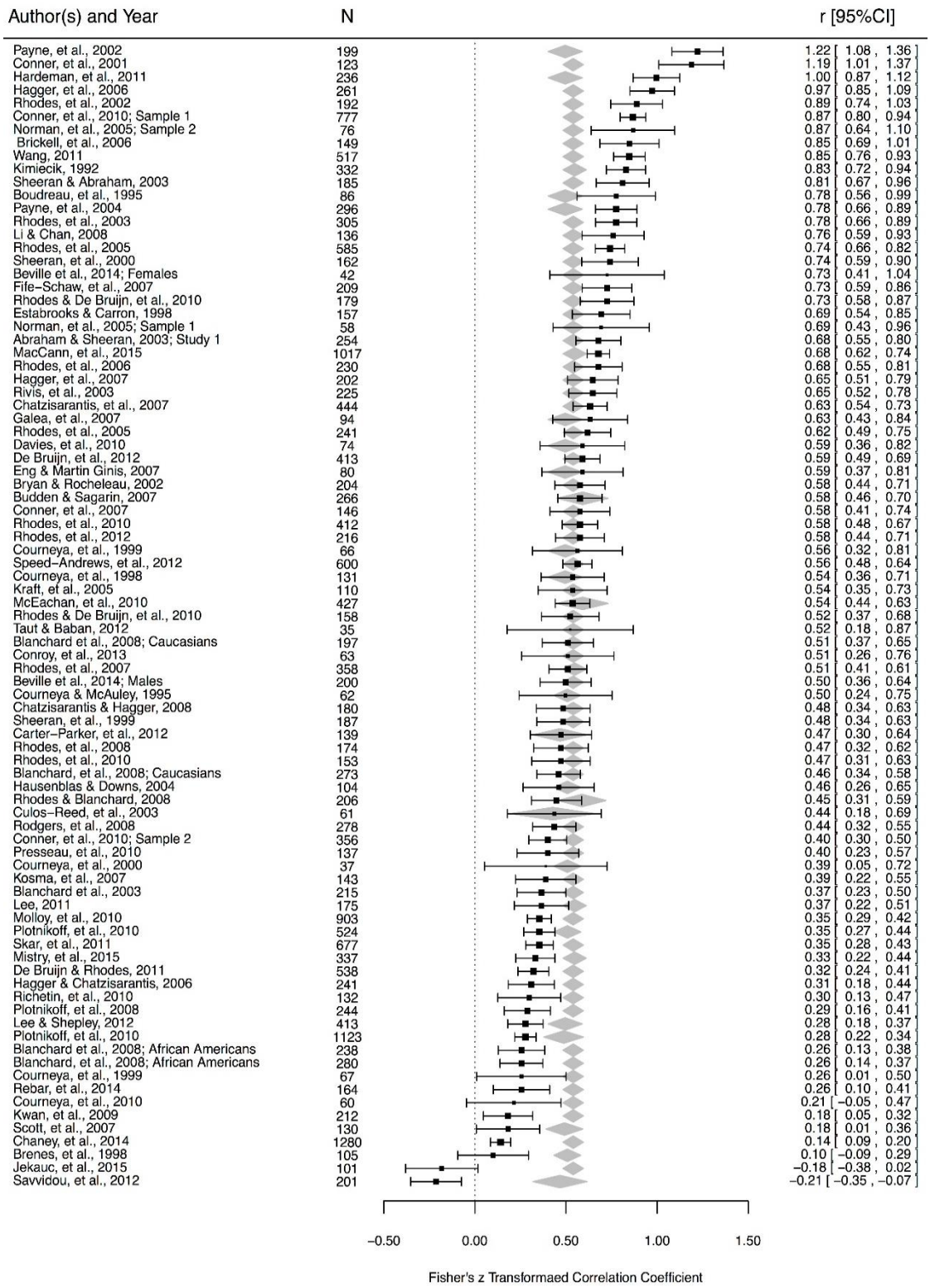


Figure 7. Fisher's z-transformed Correlations between intention and physical activity moderated by point SES indicator. Correlations (squares) and 95% confidence intervals (CI) are displayed for all effects enter into the meta-analysis. The grey diamond represents the meta-analytically estimated correlation. *N* refers to the sample size of studies.

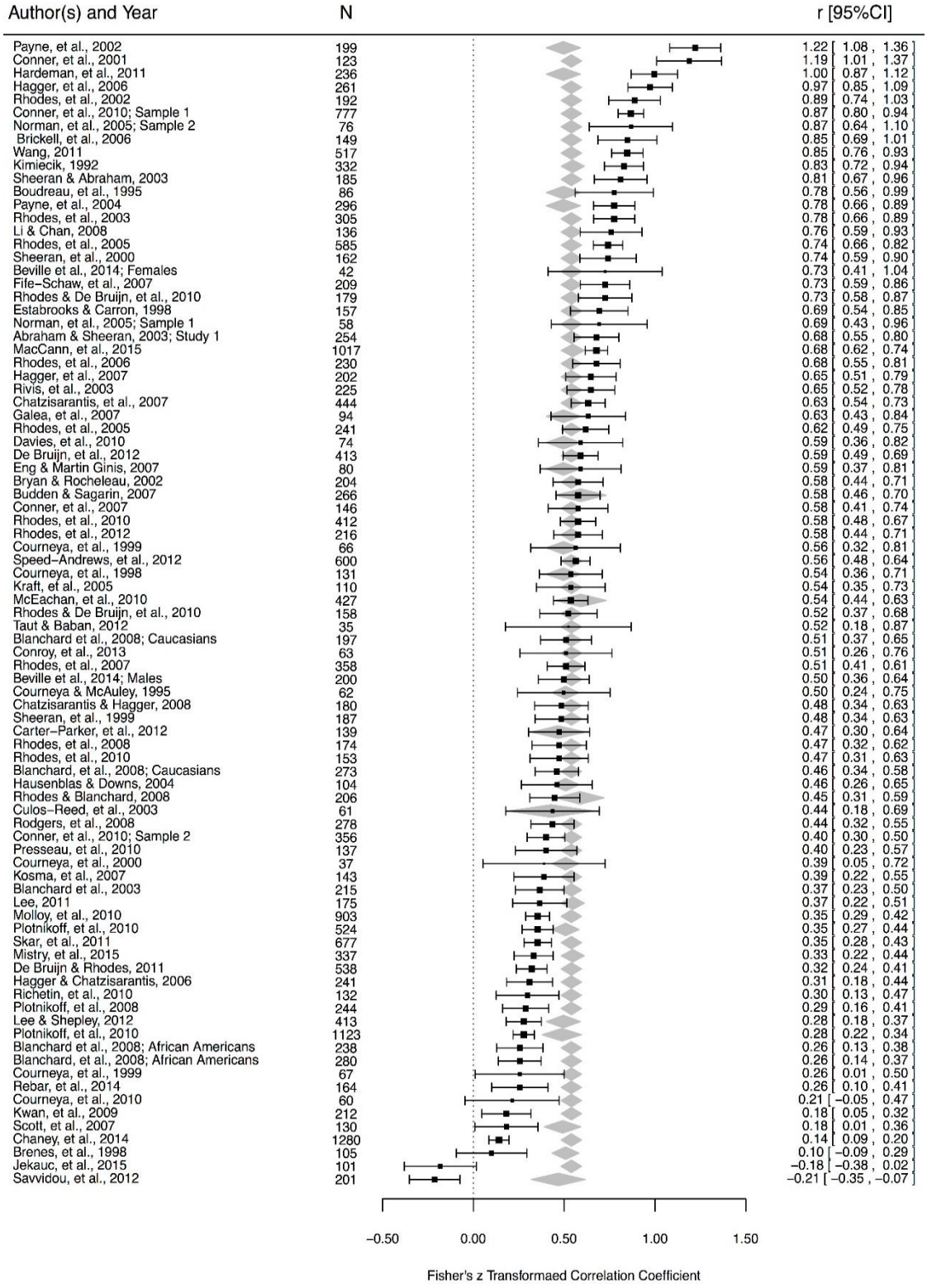


Figure 8. Fisher's z-transformed Correlations between intention and physical activity moderated by median split of combined SES indicator. Correlations (squares) and 95% confidence intervals (CI) are displayed for all effects entered into the meta-analysis. The grey diamond represents the meta-analytically estimated correlation. *N* refers to the sample size of studies.

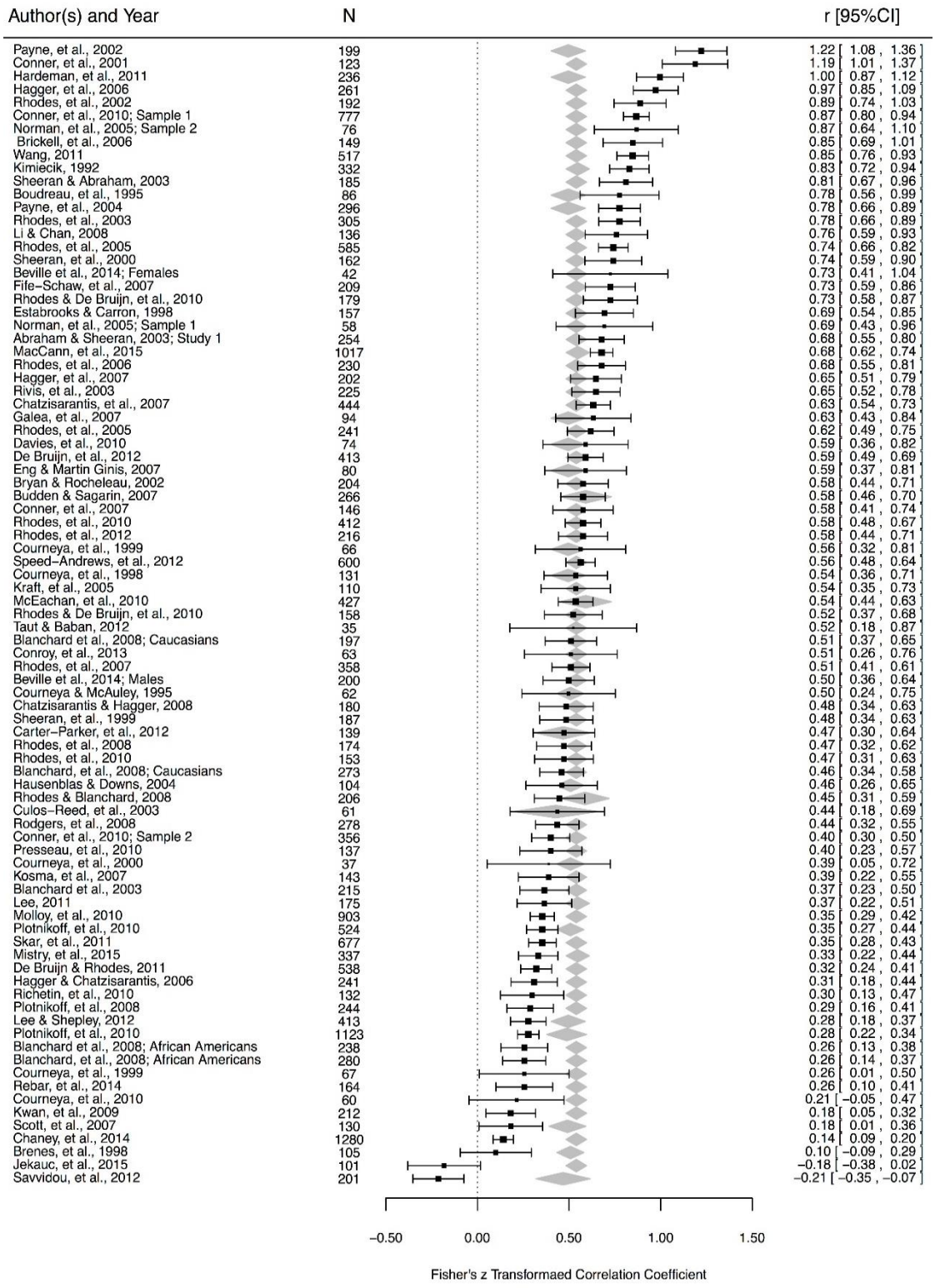


Figure 9. Fisher's z-transformed Correlations between intention and physical activity moderated by combined education indicator. Correlations (squares) and 95% confidence intervals (CI) are displayed for all effects entered into the meta-analysis. The grey diamond represents the meta-analytically estimated correlation. *N* refers to the sample size of studies.

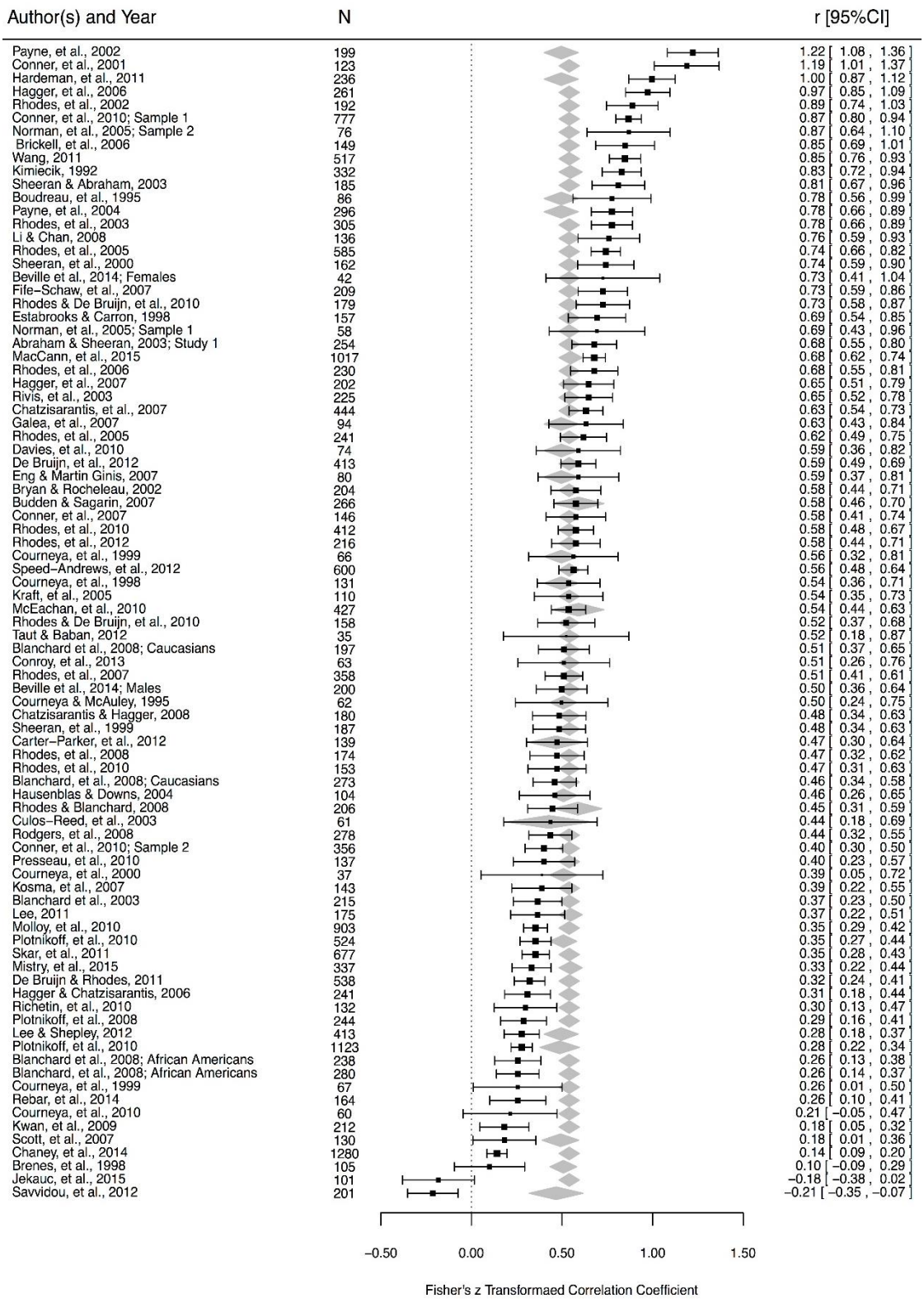


Figure 10. Fisher's z-transformed Correlations between intention and physical activity moderated by median split of combined education indicator. Correlations (squares) and 95% confidence intervals (CI) are displayed for all effects entered into the meta-analysis. The grey diamond represents the meta-analytically estimated correlation. *N* refers to the sample size of studies.

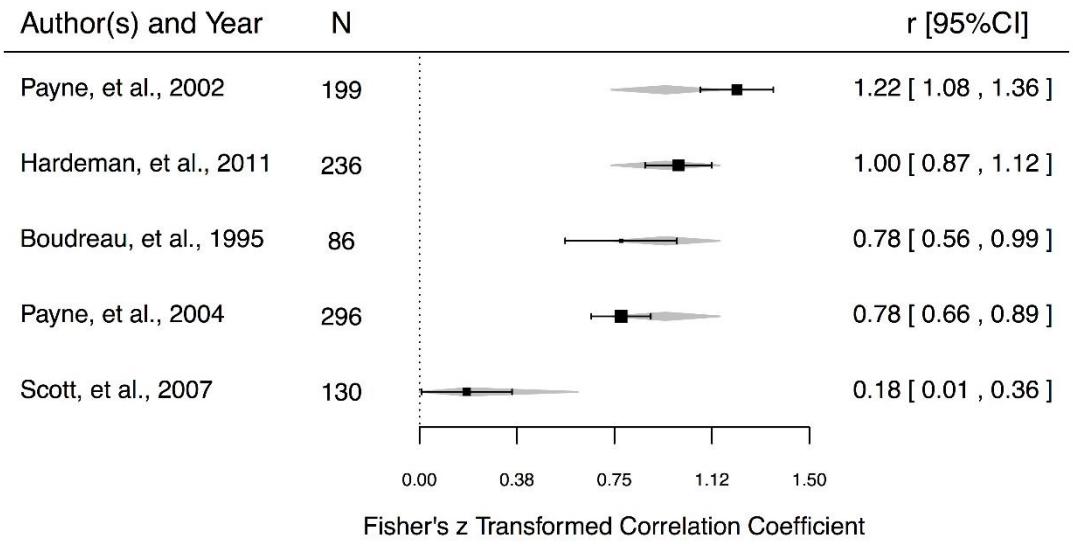


Figure 11. Fisher's z-transformed Correlations between intention and physical activity moderated by combined occupation indicator. Correlations (squares) and 95% confidence intervals (CI) are displayed for all effects entered into the meta-analysis. The grey diamond represents the meta-analytically estimated correlation. *N* refers to the sample size of studies.

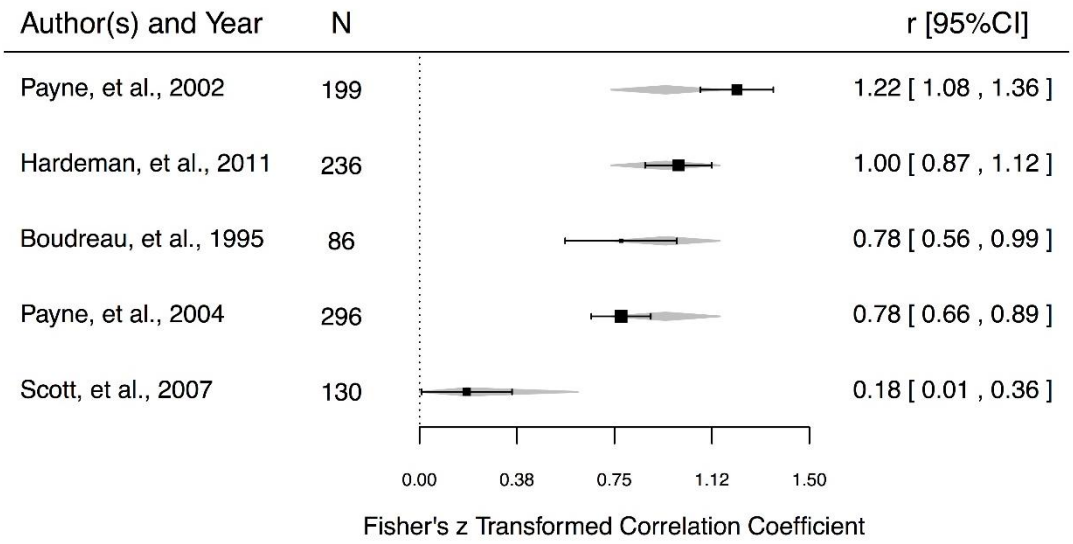


Figure 12. Fisher's z-transformed Correlations between intention and physical activity moderated by median split of combined occupation indicator. Correlations (squares) and 95% confidence intervals (CI) are displayed for all effects entered into the meta-analysis. The grey diamond represents the meta-analytically estimated correlation. *N* refers to the sample size of studies.

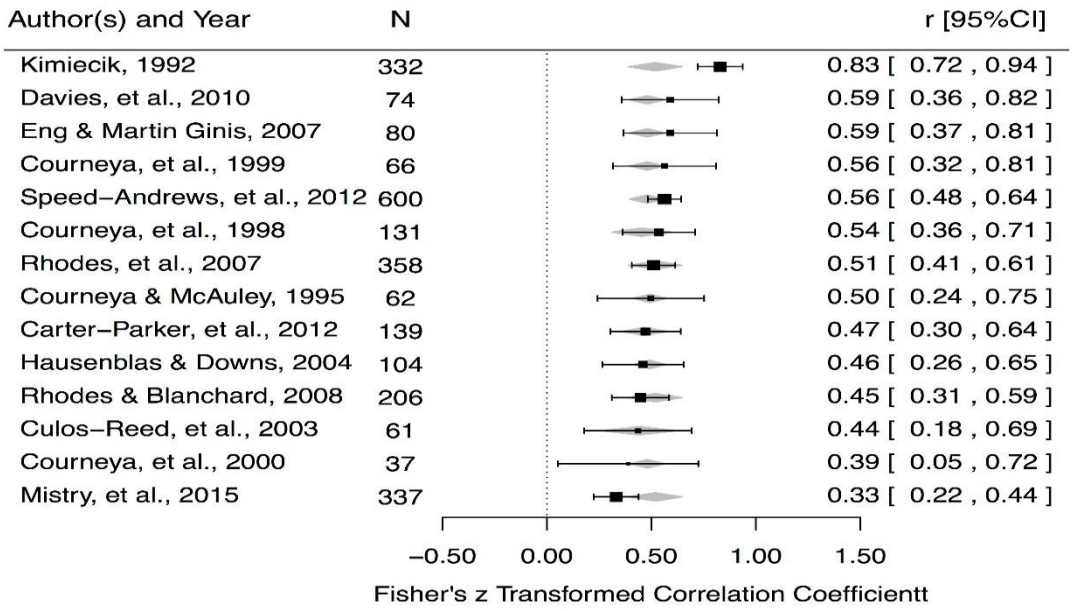


Figure 13. Fisher's z-transformed Correlations between intention and physical activity moderated by combined income indicator. Correlations (squares) and 95% confidence intervals (CI) are displayed for all effects entered into the meta-analysis. The grey diamond represents the meta-analytically estimated correlation. *N* refers to the sample size of studies.

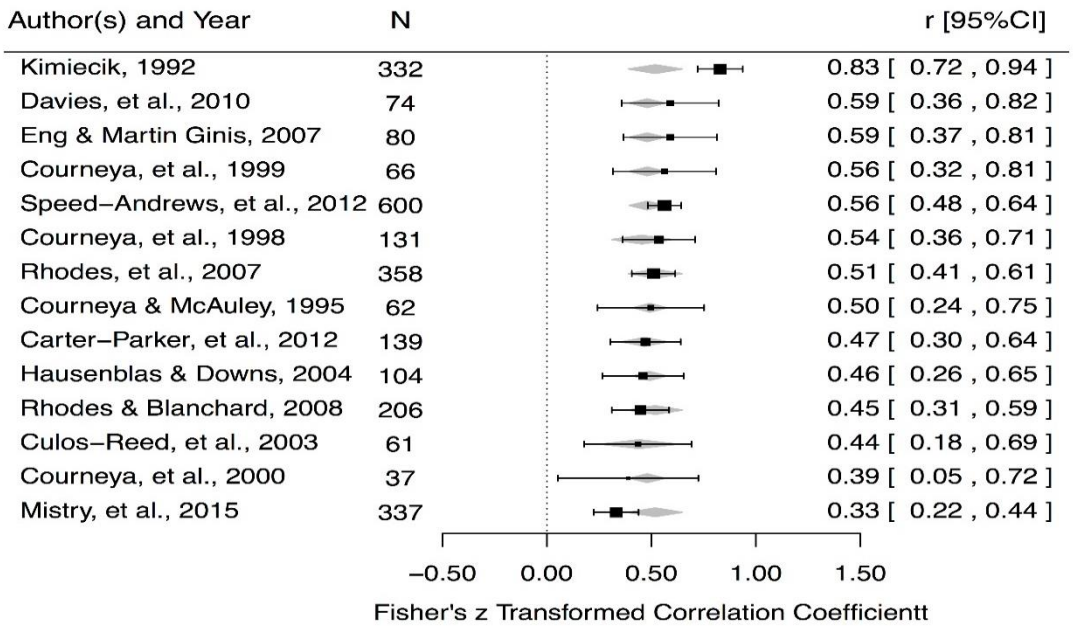
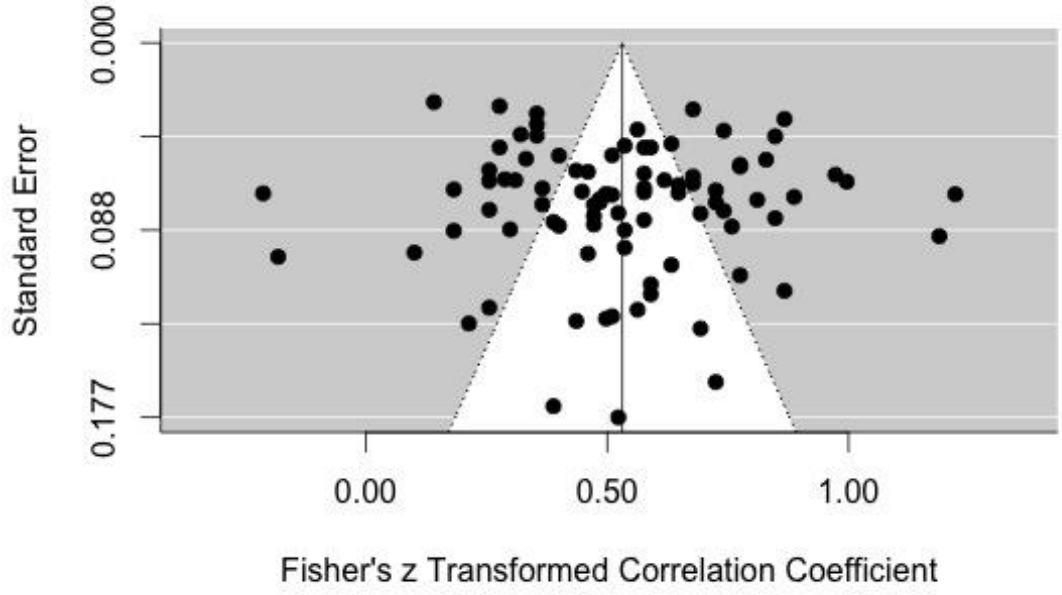
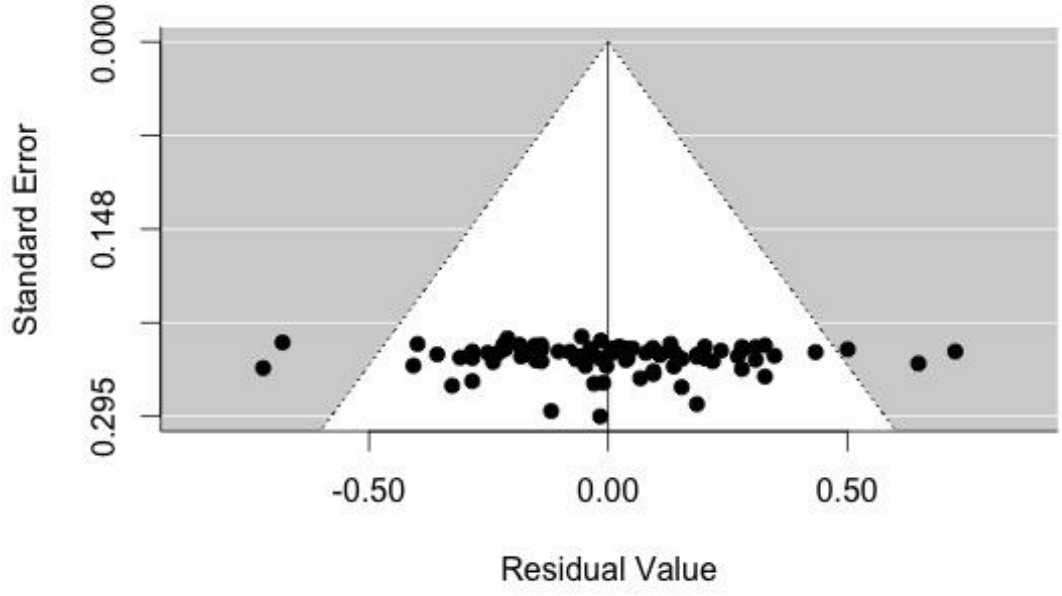


Figure 14. Fisher's z-transformed Correlations between intention and physical activity moderated by median split of combined income indicator. Correlations (squares) and 95% confidence intervals (CI) are displayed for all effects entered into the meta-analysis. The grey diamond represents the meta-analytically estimated correlation. *N* refers to the sample size of studies.

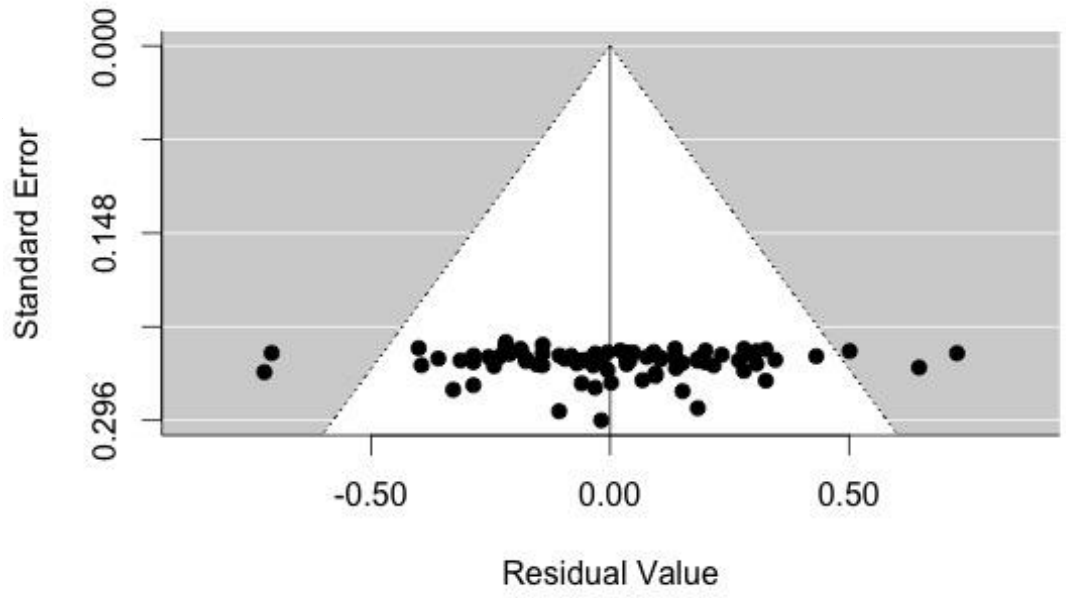
Appendix D: Funnel Plots



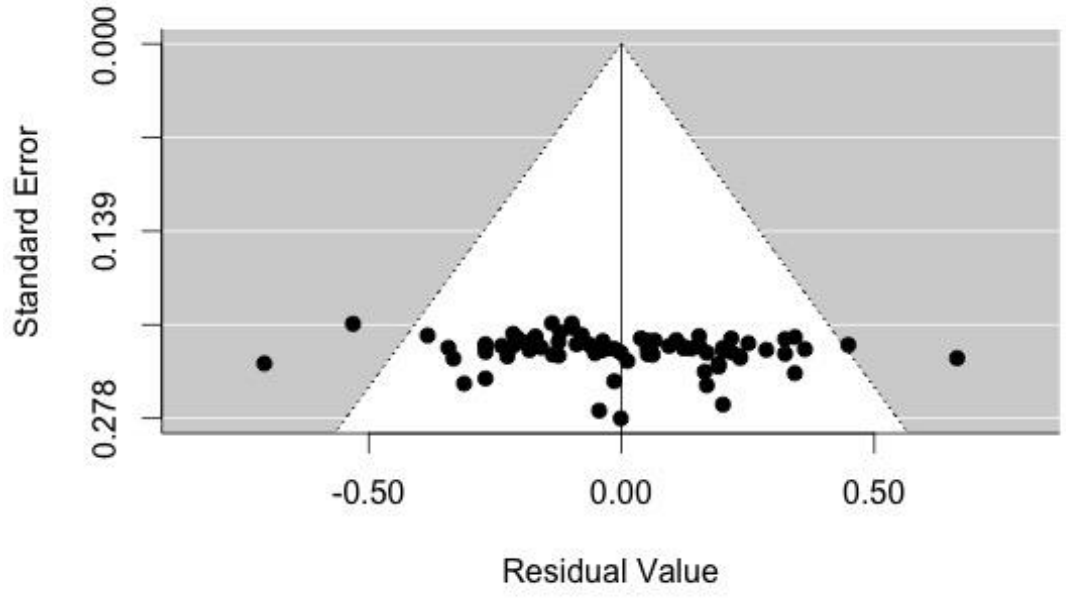
Note. Funnel plot for intention and physical activity



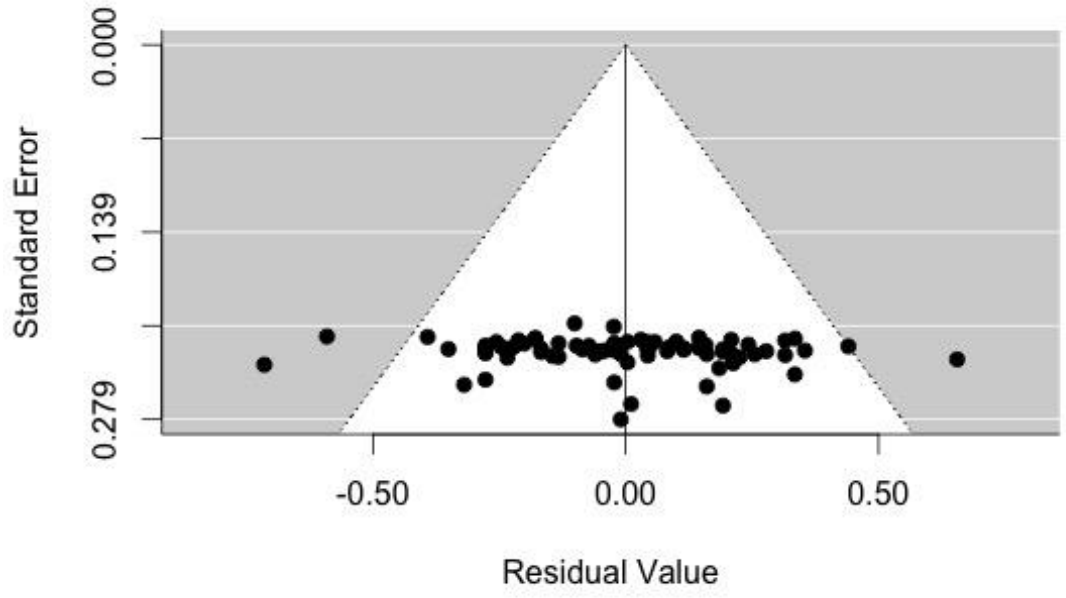
Note. Funnel plot for overall SES indicator.



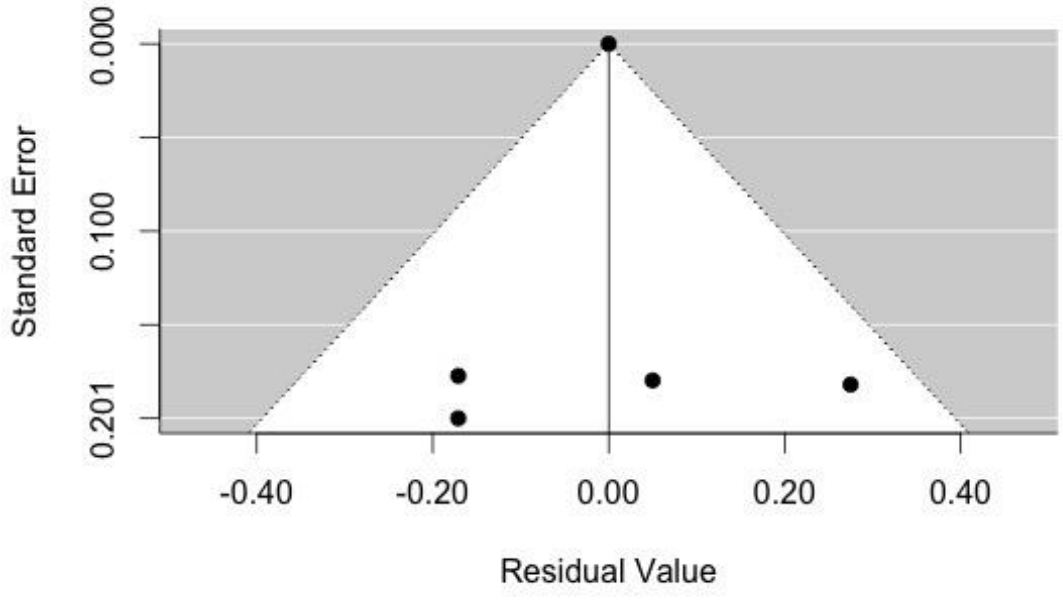
Note. Funnel plot for SES indicator (median split).



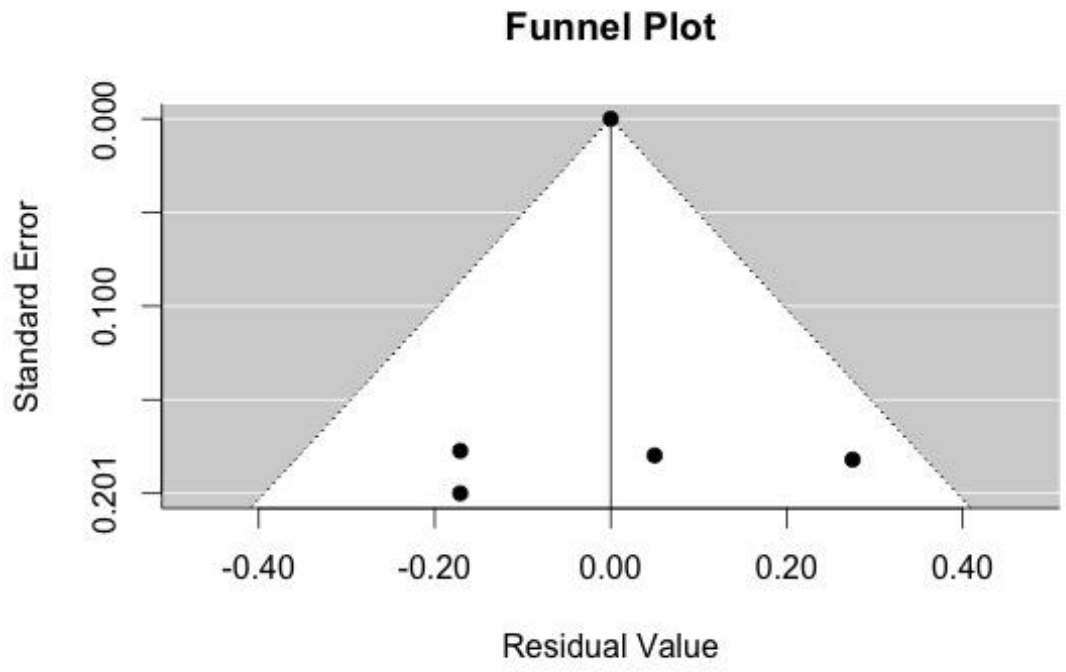
Note. Funnel plot for Education.



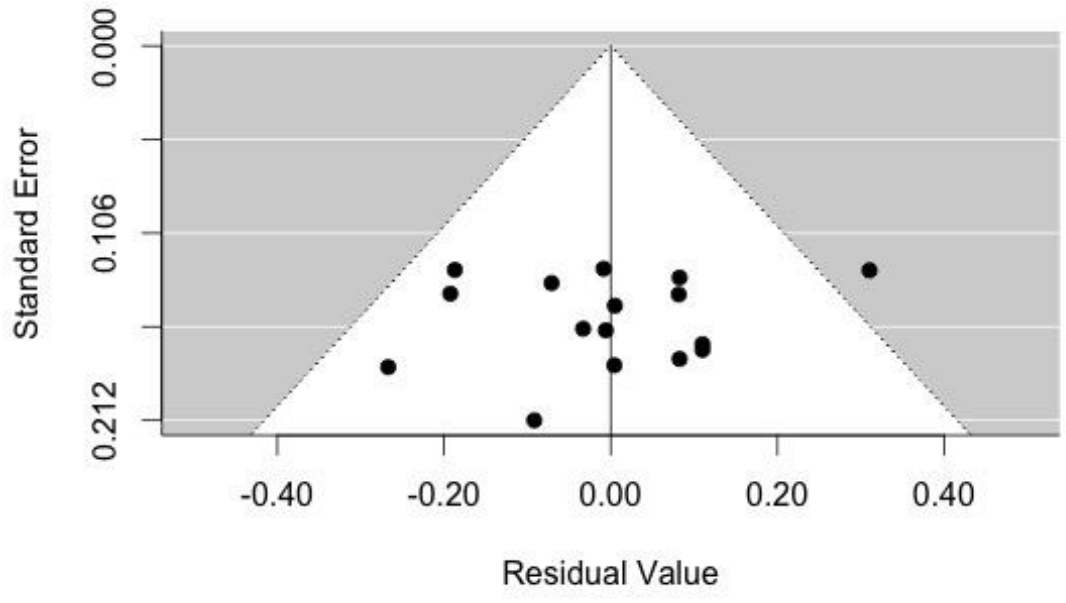
Note. Funnel plot for Education (median split).



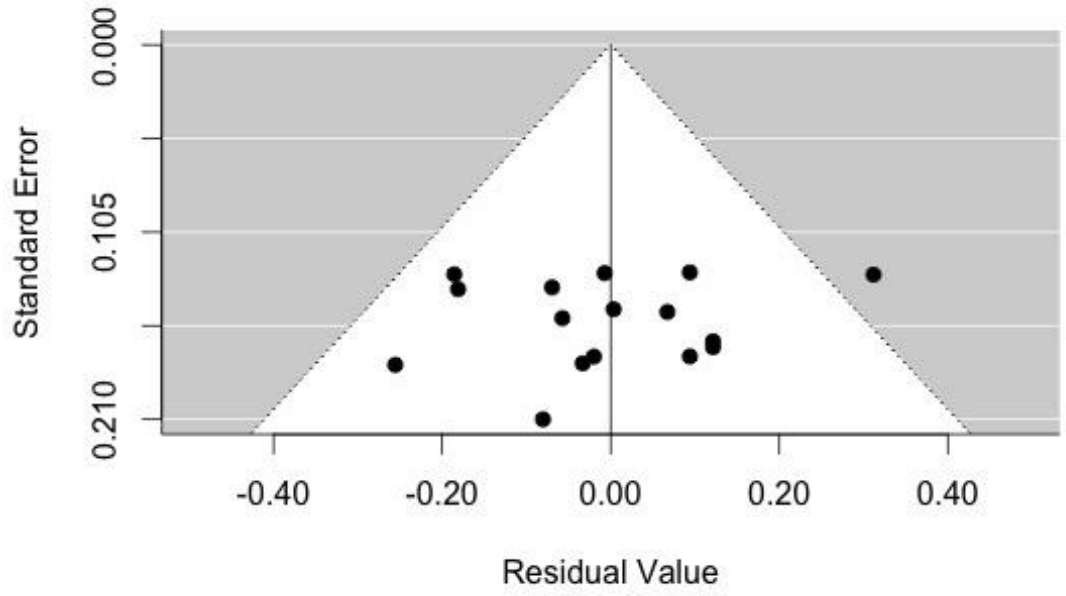
Note. Funnel plot for occupation.



Note. Funnel plot for occupation (median split)



Note. Funnel plot for Income.



Note. Funnel plot for Income (median split)